Achieve Clean Water and Protect Aquatic Ecosystems

Clean Water Goal #1: Ensure that every public water supply consistently provides water that is safe to drink

A. Self Assessment

1. Status of Drinking Water Supplies

Why is water supply protection important?	Massachusetts is a densely populated and heavily industrialized state that draws a significant portion of its water supply from vulnerable aquifers. Because our state's continued quality of life and economic competitiveness both depend on safe and abundant water, ensuring the purity of our public drinking water supplies is of paramount importance.
Where does drinking water come from?	About 95% of Massachusetts citizens get their drinking water from public water supplies. Many of the largest population centers in Massachusetts draw their drinking water from surface sources, while rural areas tend to be served by wells. About 61% of all Massachusetts residents on public supplies drink water taken from 189 reservoirs and other surface water sources. These systems tend to be municipally owned and operated. By comparison, many more public supply sources (2,683) draw from groundwater sources, but they serve only 23% of the state's population. The remaining population on public supplies (16%) is served by systems using a mix of surface and groundwater sources. About 5% of Massachusetts citizens obtain their drinking water from private wells, which are not regulated by DEP, but rather, cities and towns.
What can pollute drinking water?	Most public supply wells in Massachusetts draw from shallow sand and gravel aquifers, which are highly vulnerable to contamination. Contaminants may move with water overland or through soil to contaminate surface or ground water supplies, and may come from a variety of sources including landfills, industrial processes, septic systems, pesticide application and naturally occurring features.
How safe is our drinking water?	Public drinking water in Massachusetts is very safe. DEP has very stringent standards that ensure public drinking water is safe. Local public water suppliers are required to perform ongoing tests for the presence of bacteria, lead and other heavy metals, herbicides and pesticides, and industrial solvents. If contaminants exceed the Maximum Contaminant Level (MCL)[1] standards, the water supplier is required to notify consumers through local newspapers or radio stations. If bacteria or chemicals pose a threat to public health, the water supply is treated to remove the contaminants or taken out of service until a solution is found.

[1] Maximum Contaminant Levels are the maximum permissible level of a contaminant in water delivered to any user of a public water system.

2. Program

What are DEP's strategies to protect water supplies?

Strategies to ensure that every public water supplier consistently provides water that is safe to drink include the protection of water supply sources, any necessary treatment prior to distribution, protection and maintenance of distribution systems, monitoring of public water supply systems to ensure provision of safe drinking water, and assurance that all systems have sufficient technical, managerial and financial capacity.

Specifically, DEP has adopted the following as part of the above strategies:

- Implementation of the Watershed Approach, including reorganization of staff around watersheds
- Enhanced compliance and enforcement
- The Comprehensive Source Water Protection Plan
- Implementation of an active public awareness and participation process
- Revision of the certified operator requirements
- Implementation of the Capacity Assessment and Assurance Program to ensure that all systems have the financial technical and management capability to fully comply with all drinking water requirements
- Provision of financial incentives through reduced monitoring cost for systems with good water quality and source protection programs
- Strengthened watershed protection regulations for Class A reservoirs
- Strengthening of Title 5, and
- Implementation of new federal primacy requirements.

What are the requirements of the federal Safe Drinking Water Act (SDWA) and the Massachusetts Drinking Water Program?

Among other things, the SDWA requires that water suppliers collect periodic samples from each active source, analyze these samples in a certified laboratory for contaminants and report their findings to environmental regulators. If an MCL, Action Level or treatment technique is violated the public water system is required to take all necessary actions to eliminate the violation, including temporary shutdown of affected sources, public notification, follow-up sampling, and corrective measures.

The SDWA also requires all public water systems to be operated under the supervision of a certified operator. In addition, systems must provide annual Consumer Confidence Reports to each bill-paying customer. Public water systems are also required to have sufficient technical, managerial and financial capacity to comply with the SDWA and state drinking water standards.

What is DEP's role in carrying out these strategies?

DEP, through its Drinking Water Program, administers and enforces the requirements of the SDWA in Massachusetts. From its headquarters in Boston and regional offices in Lakeville, Springfield, Wilmington, and Worcester, and laboratory in Lawrence, DEP is involved in every facet of delivering safe, clean drinking water to everyone that lives, works, and visits our state.

DEP provides grassroots assistance to citizen groups, municipalities, regional planning agencies, and water suppliers as they implement the drinking water requirements including surface and groundwater protection programs.

What is DEP's role in carrying out these strategies? (continued)

In addition to providing individual technical assistance, conducting outreach and training for local officials, and providing guidance documents, DEP initiated several new programs from 1999-2001 to assist communities in protecting their public water sources and the long term quality of their drinking water system, as follows:

- The Source Water Assessment Program (SWAP) is a federal program. This program requires DEP to provide the public with information about the potential threats within their public water supply protection areas by May 2003. Local communities will be able to use the SWAP assessment information to make protection improvements and establish inspection and management priorities. DEP also initiated a $1.4 million effort to delineate Zone IIs (hydrogeologically determined well recharge areas) for almost 200 public supply wells. These delineations will assist communities in targeting their efforts to protect water supplies.
- The Wellhead Protection and Source Water Protection Technical Assistance/Land Management Grant programs will provide up to $710,000 to communities for protection projects.
- The Capacity Assessment and Assurance Program evaluates and assists each system to maintain sufficient technical, managerial and financial resources to stay in compliance with the SDWA requirements.
- The Consumer Confidence Reporting Program, which will require all public water systems to inform their customers annually about their supply, particularly its quality.
- The pre-implementation of compliance monitoring programs for the disinfection by-product and interim enhanced surface water treatment rules will assist systems in treating contamination effectively and will enhance the compliance and protection of drinking water systems. Pre-implementation tasks include profiling and disinfection benchmarking, training and technical assistance.

Who is responsible for delivering safe and clean water?

DEP views itself as but one member of an expansive team responsible for delivering safe, clean water to the people of Massachusetts. The state's public water suppliers have remained active members of this team by taking advantage of technical assistance and training opportunities, collecting data, watching trends, and participating in DEP rulemaking. Working in cooperation with public water suppliers for more than 25 years, DEP will continue to promote:

- Implementation of comprehensive surface and groundwater protection programs for the state's public water supplies
- Professional certification and training for drinking water operators so they are better equipped to guide their systems toward SDWA compliance
- A statewide compliance and technical assistance program to help public water suppliers meet SDWA requirements
- Targeted sampling and testing of drinking water sources for bacteria and many organic chemicals, including pesticides
- Regulatory flexibility to maximize drinking water protection while minimizing costs to water suppliers and their ratepayers
- Emergence and use of new, efficient, and low-cost technologies to help water suppliers achieve compliance with more stringent standards, and to help analytical laboratories accurately detect contaminant concentrations at lower levels
- Initiation of early contamination detection, cross connection control, public education, and other programs aimed at maintaining the quality of drinking water from the source to the tap
- Expanded use of computer and information technology in all facets of the drinking water program, including source water mapping, data management, and communications with water suppliers, and
- Better consumer awareness about the need for safe, clean drinking water and the programs being implemented at the local, state, and federal levels to ensure that today's abundant supplies are conserved and protected for the future.

How are Massachusetts water suppliers doing?

Massachusetts public water suppliers generally have an excellent compliance track record. In 2000, the most recent year for which complete data is available, 94% reported no MCL violations. Out of a total of 175 systems with access to surface water sources and required to meet SWTR treatment technique requirements, 99.4% were in compliance (97% in full compliance and 3% continuing to work under approved compliance agreements consistent with legal requirements under the Safe Drinking Water Act). Massachusetts' overall excellent compliance record is due to the continuous hard work of the 1,643 water systems in the Commonwealth. Through their implementation of source protection programs that include routine inspections and consumer education components, local water systems are better able to protect their sources of water. At the end of 2000, 608 water systems had water supply protection controls in place with 5.6 million people drinking water from a source with some measure of source protection. Public water suppliers in the Commonwealth are also in the forefront in seeking out new and innovative, cost effective treatment technologies to improve the level of water treatment. Our public water suppliers have significantly improved their monitoring and reporting compliance rate despite the increased monitoring and reporting requirements. In 2000, 81% met all monitoring and reporting requirements. Massachusetts public water suppliers are attending training in record numbers and are planning ahead to ensure the ability of their systems to comply with all drinking water requirements.

3. Challenges for 2002-2003

Why must DEP continue its drinking water protection efforts?

Massachusetts is recognized by national associations and other states as a leader and innovator in safeguarding its water supplies. As it stands on the threshold of a new century, DEP must be poised to respond creatively and effectively to the many water supply challenges remaining to be met. New housing starts and industrial expansion are once again on the increase, placing additional demands on our drinking water reserves. It will be all that much more important, then, that DEP and public water suppliers not only maintain, but expand, an effective drinking water program and aggressive source water protection initiatives in the years to come.

What is DEP's approach toward achieving compliance?

DEP continues moving toward more holistic regulation, viewing all regulated facilities and their collective impacts on whole watershed ecosystems at once. The agency will need to explore additional ways in which it can minimize burdens on water suppliers and costs to consumers while maximizing the environmental and public health yields of its programs.

Even as it begins moving away from the traditional command and control approach, however, DEP will need to step up its efforts to identify and bring into SDWA compliance the many public water suppliers who until now have operated without government oversight. And for all public water suppliers, but particularly for those whose customer bases are small or transient, DEP must strive to expand its education, outreach, and technical assistance programs.

Equally important, DEP must continue to keep the consumers of Massachusetts' water informed about, and involved in, ongoing efforts to ensure that drinking water remains clean, safe, and plentiful for future generations. DEP will coordinate all of its informational and outreach programs, like the Consumer Confidence Reporting, to keep citizens informed and involved. New technologies for interacting with and training both water suppliers and consumers will be employed. This will include better utilization of web pages, telecommunications information broadcast functions and distance learning.

DEP is also strongly committed to the identification and development of innovative, effective and low-cost technologies for the treatment of drinking water. In the coming years, water systems will need these types of technologies to comply with all of the new requirements.

Central to any effective strategy to address remaining environmental challenges is the existence of a strong and coherent compliance and enforcement strategy. DEP's safe drinking water compliance and enforcement strategy has two components: geographic and programmatic.

- Geographically, the Watershed Approach is the overarching means of identifying and taking action on the most serious violations affecting the most critical resource areas.
- Each program unit in the Bureau of Resource Protection has identified types of activities that should be targeted for compliance and enforcement focus.

Achieve Clean Water and Protect Aquatic Ecosystems

Clean Water Goal #2: Reduce, eliminate, and/or control both point and nonpoint discharges to surface and groundwater

A. Self Assessment

1. Status of Water Resources

Why is it important to protect surface and groundwater?

Water quality protection is of the utmost importance to protect existing and future drinking water supplies and to achieve the designated goals for our surface waters. Those goals include but are not limited to:

- Providing suitable water quality conditions for the survival and reproduction of aquatic flora and fauna
- Providing adequate water quality for recreational activities such as swimming, boating, and fishing by decreasing the risk of exposure when coming in contact with the water, and
- Providing protection of fish and wildlife and the public who may consume them by ensuring fish and shellfish remain edible.

What is the status of rivers and streams?

In Massachusetts, 1,496 river miles of the state's 8,229 total river miles (18%) were assessed in the 2000 305(b) Report for one or more of their designated uses (see Figure 1). The assessed river miles comprise the major mainstem rivers in the state and those tributaries with major point sources of pollution. These rivers are the most visible and flow through the major population centers of the state. The 82% of river miles that are unassessed consist largely of small headwater streams and minor tributaries with no known or suspected pollution problems. From a point source pollution perspective these streams could be assumed as supporting their uses. However, this assumption is not always valid because some of these streams may be impacted by nonpoint pollution..

What is DEP's assessment of rivers?

Figure 1 provides a graphic summary of the number of river miles assessed, level of overall use support and a breakdown of the percentage of assessed miles based on individual use.[2] Waters are prioritized and assessed based on concerns expressed by stakeholders in each watershed, the need to verify that waters should either be added or deleted from the list of impaired waters, known or suspected water quality and/or pollution problems and the need to collect data for purposes of implementing and monitoring Total Maximum Daily Loads (TMDLs).[3] Figure 2 illustrates the causes of impairment and potential sources versus the percentage of miles assessed.

[2] Figures 1 through 6 are taken from the 2000 Summary of Water Quality Report (305(b)). Note that in certain cases percentages of these figures add to more than 100% because rivers, lakes, and marine waters can have multiple causes and sources of nonsupport and impairment. In the case of lakes (Figure 4), sources of impairment total only 60% because 40% of assessed lakes are not impaired. In Figures 1, 3, and 5, individual use totals may not equal 100% due to rounding. Also in Figures 1, 3, and 5, the "Level of Overall Use Support" pie chart does not show an average of individual use percentages. Instead, the chart shows percentages of assessed river miles fully, partially, or not supporting *one or more uses*, including some uses not listed at the bottom of the page.

[3] Under Section 303(d) of the federal Clean Water Act, states are required to develop a list of impaired waterbodies and TMDLs, which are estimates of the maximum amount of pollution allowed for each impaired waterbody. TMDLs are then used to make decisions on permits, enforcement action, and priorities for inspections.

What are the causes of continued impairment? How are they being addressed?

Quantifying and eliminating known impairments will require targeting different types and sources of pollution. Nutrients from point and nonpoint discharges, bacterial contamination in nonpoint sources from stormwater runoff and combined sewer overflows, and toxic contamination in sediments (largely historical) prevent the remaining river miles from meeting their goal. Bacteria impact over half of the rivers assessed and are largely attributable to stormwater runoff and combined sewer overflows (CSO). The CSO problem is being aggressively addressed by ongoing abatement and enforcement programs. The larger problem of abating nonpoint source pollution as well as excessive nutrient discharges require new approaches to remediation that are incorporated in the Watershed Approach and TMDL programs. Toxic pollutants contaminating sediments and moving up the food chain into fish tissue poses another problem demanding nontraditional solutions. The contamination appears to be largely historical. Better definition of the nature and extent of the problem, more data, and better assessment tools are needed before suitable abatement measures can be selected.

Isolated cases of municipal and industrial point source problems still persist that point to the importance of compliance and enforcement of National Pollution Discharge Elimination System (NPDES) permits as well as the larger issue of ensuring proper operation and maintenance of existing wastewater treatment facilities.

What has happened to the water quality of rivers in the past three decades?

The river cleanup program has enjoyed enormous success. More than half of the river miles assessed now support aquatic life, swimming and boating, with the qualification that half of the swimmable miles still experience some intermittent problems. The significance of this information is that swimming and fishing in most of these waters would have been unthinkable 25 years ago. This highlights the success of the industrial and municipal point source cleanup program. In particular, the state's Municipal Facilities Program directed nearly 4 billion dollars of federal and state funds since 1967 in achieving this progress. Currently, there are 116 Publicly Owned Treatment Works (POTWs) that treat over a billion gallons of sanitary and industrial wastewater each day and serve 70% of the state population.

Table 3: Water Quality Definitions

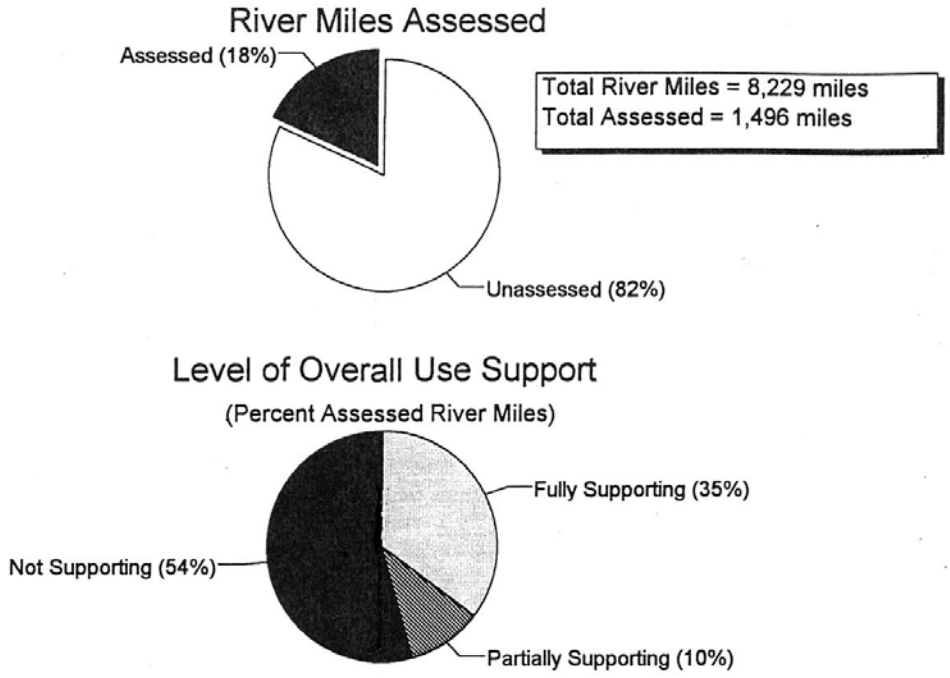
Designated beneficial use, designated use, or individual use is a desirable use that water quality should support. The uses listed below are employed by the Massachusetts DEP to help define water quality conditions. Each designated use has a unique set of water quality requirements or criteria that must be met for the use to be realized.

Use	Definition
Aquatic Life Support	The waterbody provides suitable habitat for protection and propagation of desirable fish, shellfish, and other aquatic organisms.
Fish Consumption	The waterbody supports fish free from contamination that could pose a human health risk to consumers.
Primary Contact Recreation - swimming	People can swim in the waterbody without risk of adverse health effects from ingestion or contact with the water.
Secondary Contact Recreation	People can perform activities on the water (such as boating) without risk of adverse human health effects from ingestion or contact with the water.

Levels of Use Support are assigned by the Massachusetts DEP to each waterbody. The level of use support is determined by comparing monitoring data with numeric criteria for each use designated for a particular waterbody.

Use Support Level	Water Quality Condition; Determination	Definition
Fully Supporting	Good; All designated beneficial uses are fully supported.	Water quality meets designated use criteria.
Partially Supporting	Fair (Impaired); One or more designated beneficial uses are partially supported and the remaining ones are fully supported.	Water quality fails to meet designated use criteria at times, and/or the data collected was insufficient or inconclusive for full support determination.
Not supporting	Poor (Impaired); One or more designated beneficial uses are not supported.	Water quality frequently fails to meet designated use criteria.

Figure 1
River Assessment



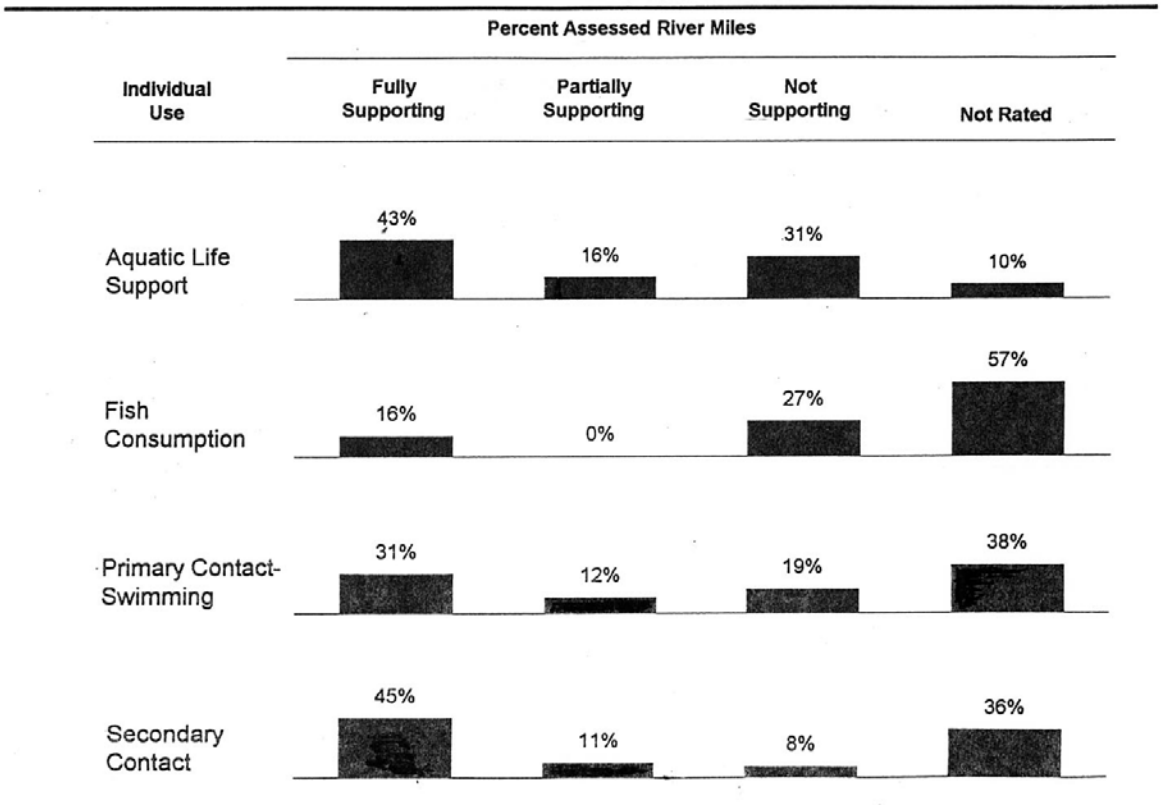
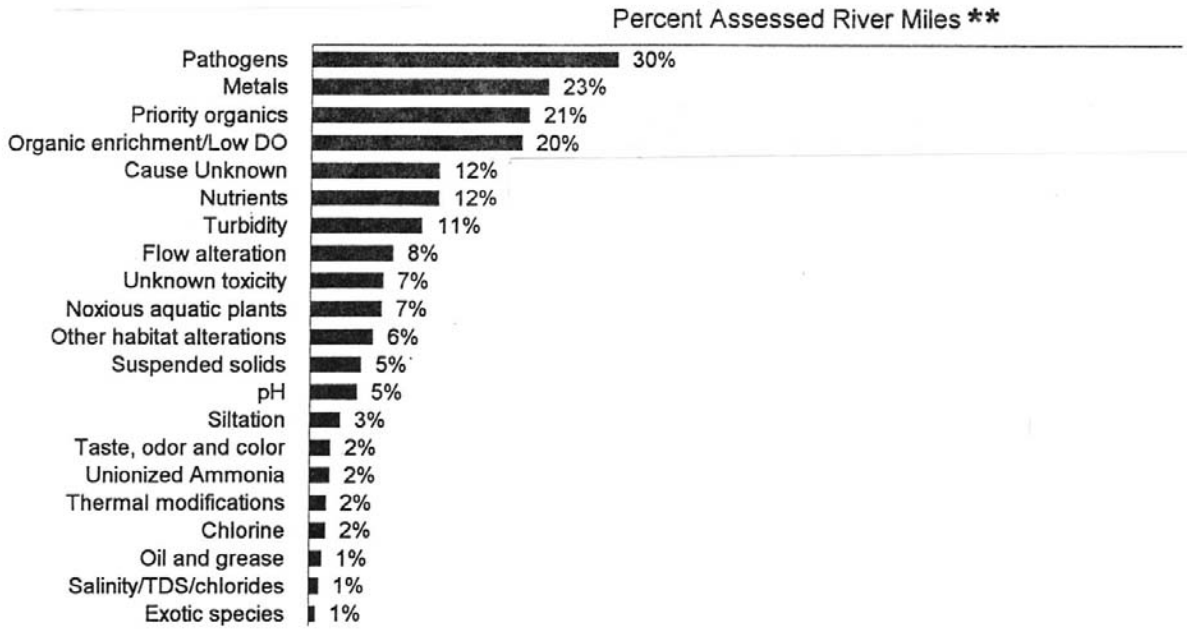


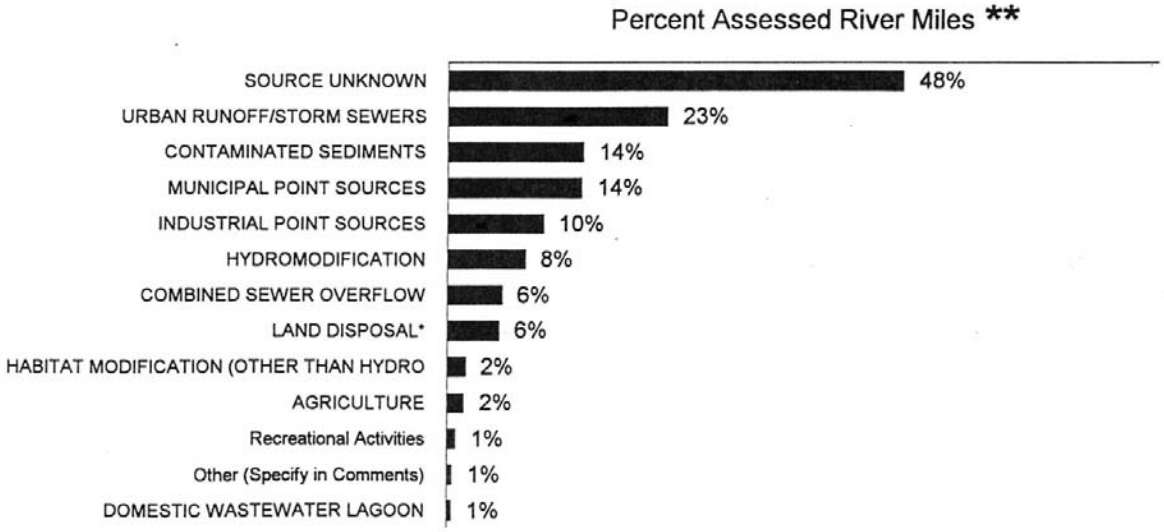
Figure 2

River Assessment

Pollutants/Causes of Impairment



Sources of Impairment



*-Includes onsite wastewater systems

** -River Miles Assessed = 1,496 miles

What is the status of lakes?

Fifty-four percent of the total 151,173 acres of lakes in Massachusetts are currently assessed. Figures 3 and 4 provide a graphic summary of the lake assessment results. Source identification of pollutants is not presently part of the lake assessment program. It is hoped that the Watershed Approach and TMDL programs will assist the DEP in identifying many of these potential sources in the coming years.

What is DEP's assessment of lakes?

Forty-one percent of the acres assessed fully supported all their uses; about 32 % of acres assessed partially supported their uses, and approximately 27% did not support any of their uses. Of the individual use categories (aquatic life, fish consumption, primary contact, and secondary contact), only secondary contact recreation was well supported (71%). Other uses indicated much lower levels of full support, however less total acres were evaluated for the different uses. These changes reflect the shift in focus of the DEP's lake monitoring from the detection of eutrophication problems to the documentation of aquatic plant cover and the presence of nonnative species populations. Forty percent of the acreage assessed only partially supported the aquatic life use.

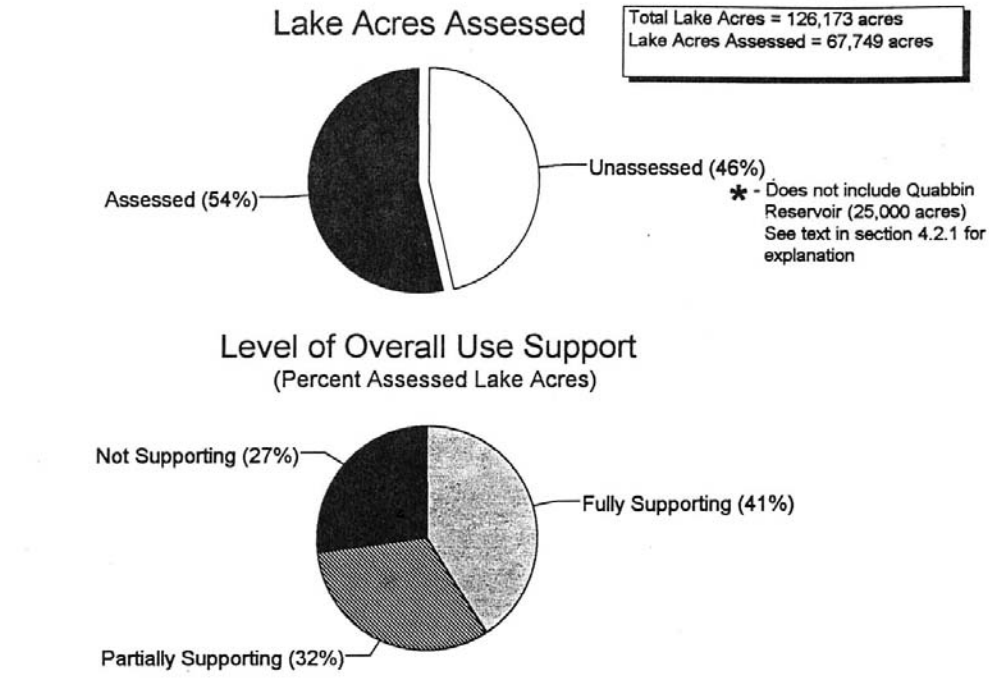
What are the symptoms and causes of continued impairment? How are they being addressed?

The symptoms of impairment include an imbalance of macrophyte communities (with plants such as water lilies and bladderworts) due to the presence of nonnative plant species (such as eurasian milfoil and water chestnut), the proliferation of aquatic plants in general, and excess metals (associated with the bioaccumulation of mercury in fish). Non-native species are undesirable because they out-compete native species of plants, reduce diversity and have other negative effects on the biota of a waterbody.

The causes of these stressors are largely unknown, although nonpoint sources, including stormwater runoff and on-site wastewater systems, are largely suspected to add additional nutrients that result in the proliferation of plants. The sources of mercury are thought to be primarily from in-state and out-of-state air deposition from power plant emissions and municipal waste combustors.

Pollutant discharges from on-site wastewater treatment systems are being addressed through the implementation of revised Title 5 regulations, which now require periodic inspections and upgrades where systems are found to be failing. Stormwater runoff is being presently being addressed by continued implementation of stormwater Best Management Practices. Future activities to address the issue will include the development of TMDLs and implementation of the new EPA Phase 2 stormwater rules. These initiatives should reduce impairment of lakes and other surface and groundwaters. See "Emissions and Deposition of Toxic Air Pollutants" under part 2e of the National Air Strategy Goal for more information on mercury in the environment and what is being done to address this problem.

Figure 3
Lake Assessment*



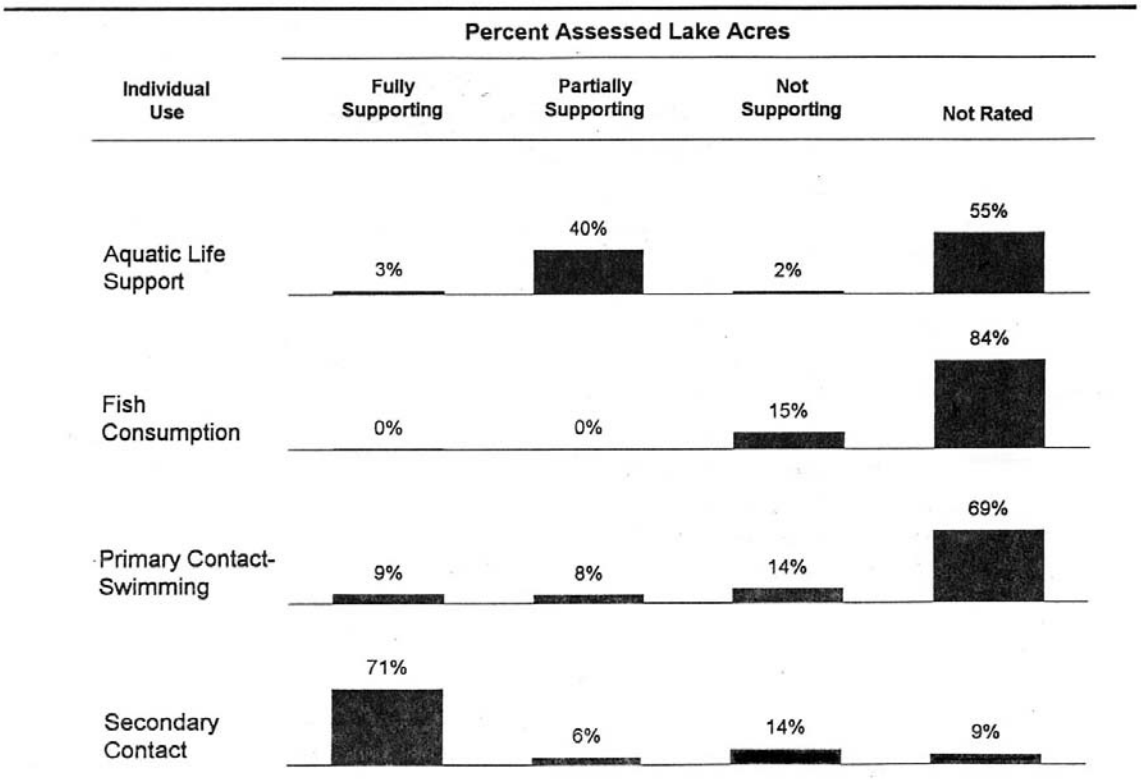
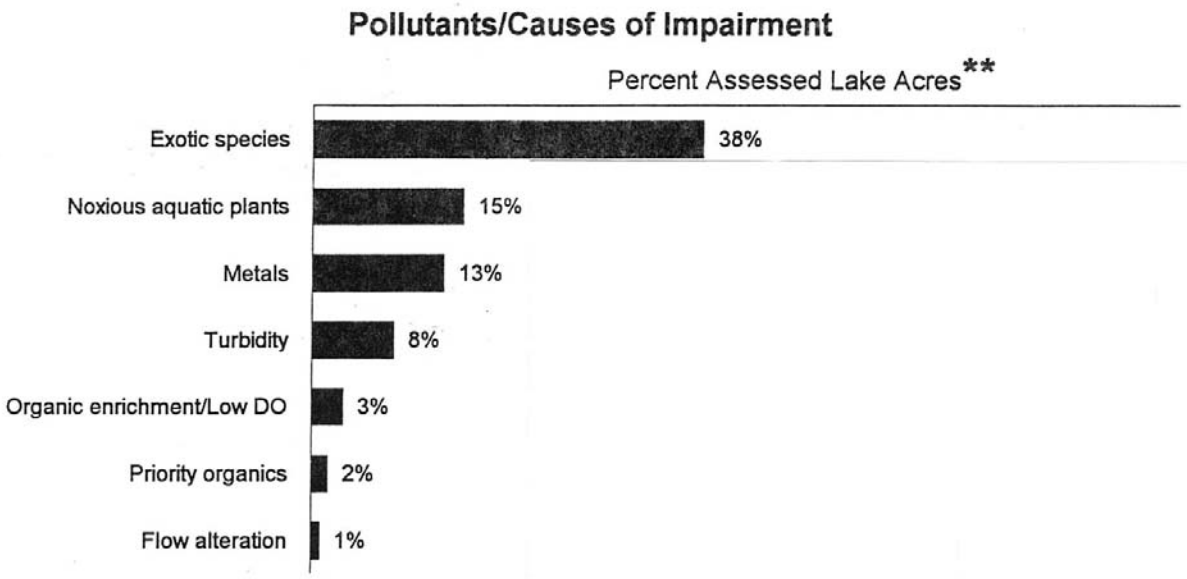
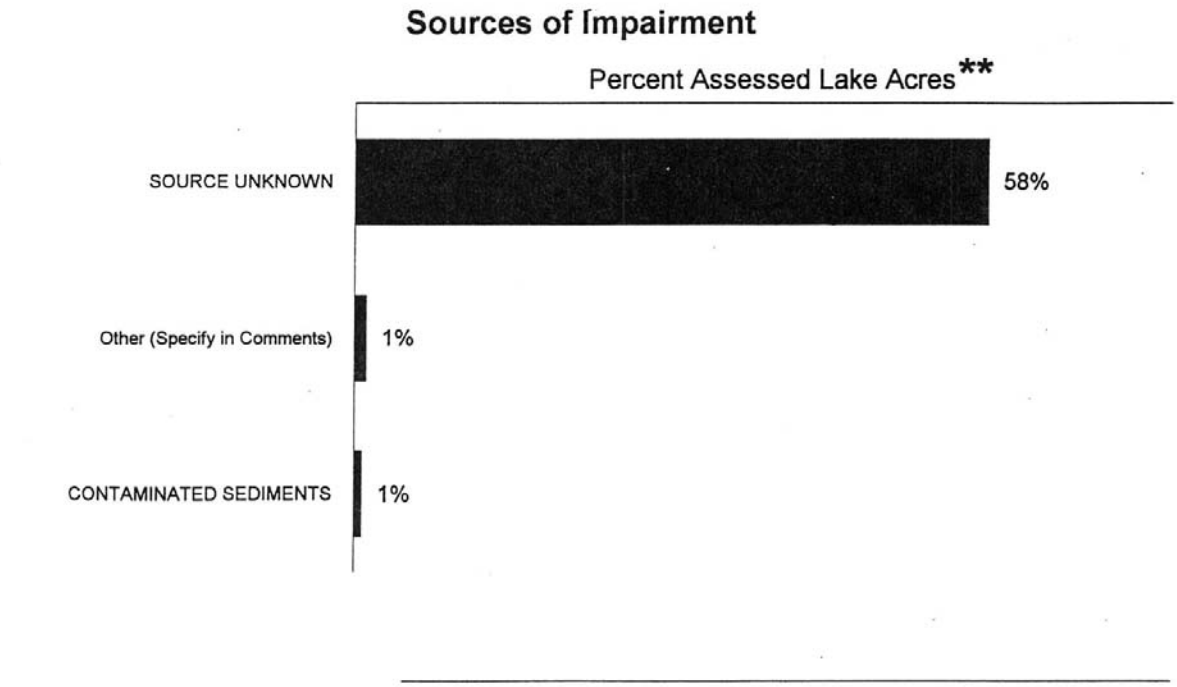


Figure 4
Lake Assessment*





*-Does not include Quabbin Reservoir
**-Lake Acres Assessed = 67,748 acres

What is the status of marine waters?

In Massachusetts, 128 square miles (5%) of marine waters were assessed in the 2000 305(b) Report. DEP's assessment (Figures 5 and 6) is heavily biased toward areas that were previously polluted. Over half (55%) of the assessed marine waters did not support one or more of their designated uses. Since the DEP's assessment concentrates on near shore areas of harbors and bays, the overall quality of coastal waters is better than one would observe looking only at the DEP's data. Data from the Division of Marine Fisheries cover a much larger portion of open ocean waters. Their data indicate approximately 9% of the coastal waters assessed did not support shellfishing. Since shellfishing demands a high level of water quality it can be assumed that the overall quality of coastal waters is underestimated by this assessment. Eutrophication is coastal embayments is another growing issue. DEP is presently developing a plan to assess a large number of embayments in southeastern Massachusetts.

What is DEP's assessment of marine waters?

The assessment shows that marine waters are lagging behind the river cleanup. Only 36% of the assessed waters fully supported all of their uses. However, all the major urban areas on the coast are either in facilities planning or construction phases of new cleanup efforts. Foremost among these is a massive project to clean up Boston Harbor. Sewer system rehabilitation and improvements in sludge handling have already made positive impacts on the waters of Boston Harbor.

When uses are examined individually, 11% of the assessed waters support aquatic life fully. About half of the waters fully or partially support primary and secondary contact recreation.

What are the causes of continued impairment? How are they being addressed?

The major cause of nonsupport in marine waters is bacterial contamination. This is the cause of impacts in about two-thirds of the waters assessed. The predominant sources of these bacteria are stormwater runoff (31%) and combined sewer overflows (25%) although other sources may contribute. Cleanup of combined sewer overflows is underway in many locations. Cleanup of stormwater runoff will result from implementation of the new EPA Phase 2 Regulations. However this will take some time.

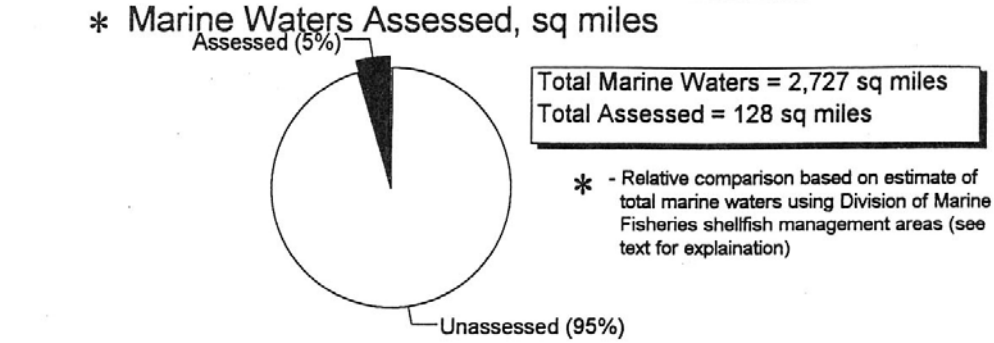
Toxic contamination of marine waters is demonstrated by areas of contaminated sediments in Boston Harbor, Quincy Bay, areas of the North Shore and Buzzards Bay. These are areas of historical pollution and pose special problems for cleanup efforts, but experience gained in the ongoing Buzzards Bay cleanup may provide insight for future efforts.

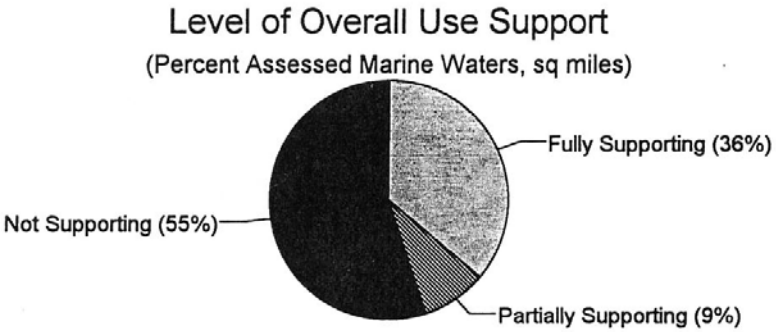
Municipal point sources impact 10% of the waters assessed. Those impacts include nutrient enrichment and toxicity from ammonia. Facilities planning in the major urban areas should correct these problems.

Approximately 48% of the waters assessed are impacted from unknown sources. The complexity of marine hydrology sometimes makes it difficult to attribute cause and effect. As previously noted DEP is currently developing a strategy to assess many coastal embayments in southeastern Massachusetts to determine the extent of the problem and to develop modeling approaches which can be used for determining remedial actions.

Figure 5

Marine Waters Assessment





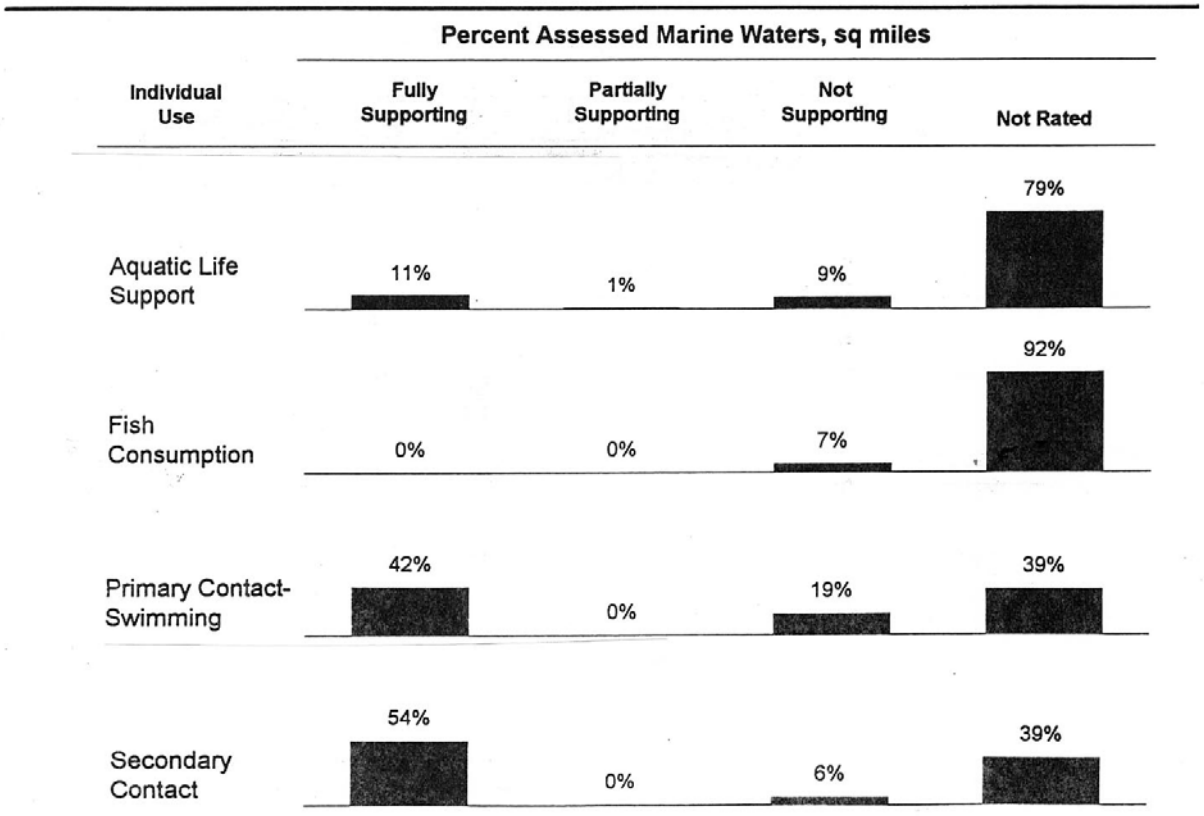
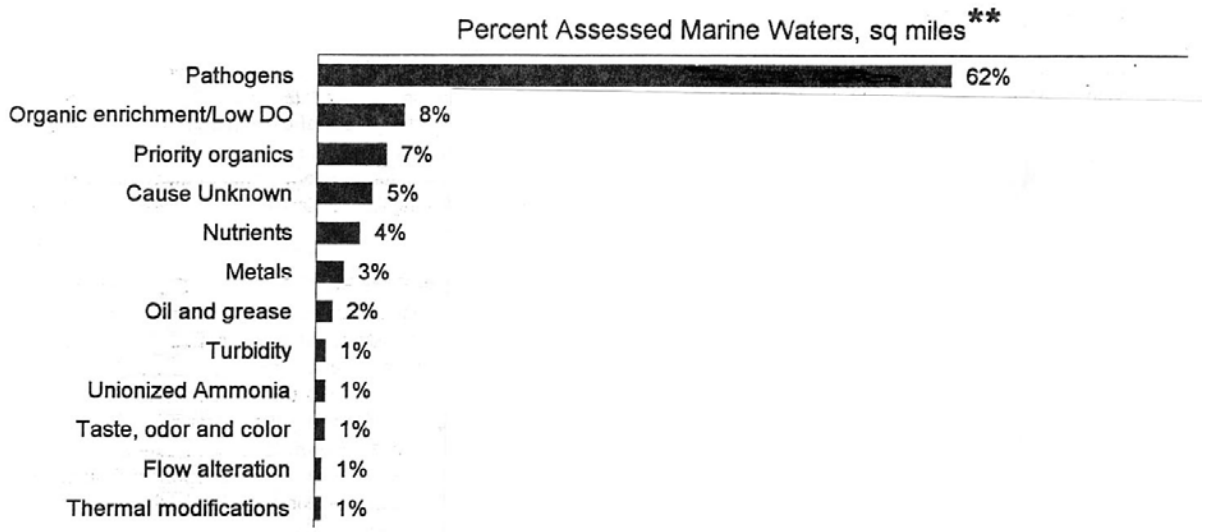
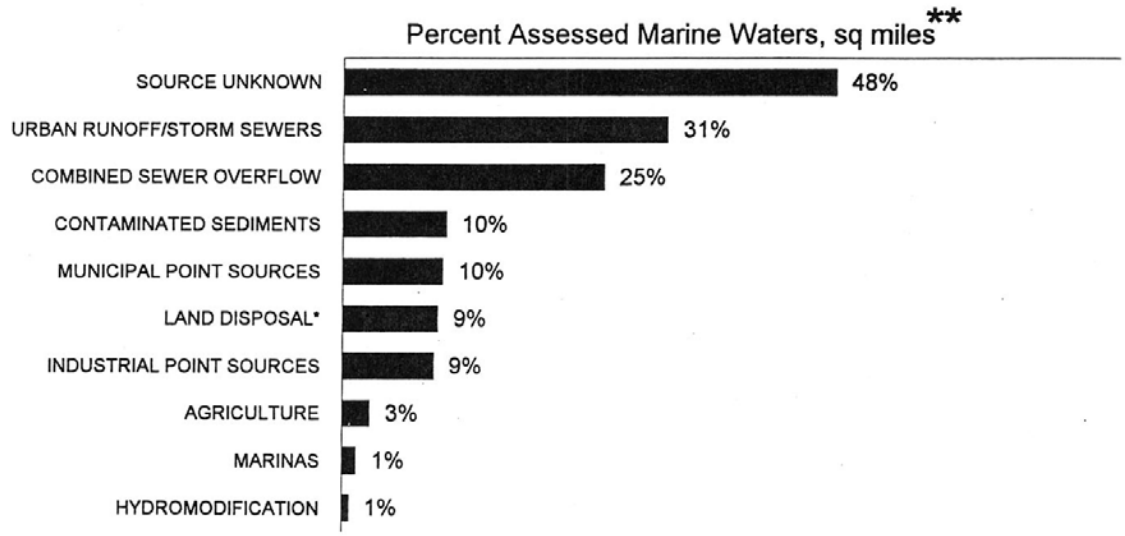


Figure 6
Marine Waters Assessment

Pollutants/Causes of Impairment



Sources of Impairment



* -Includes onsite wastewater systems

** -Marine Waters Assessed = 128 sq miles

Why is acid deposition important?

Acid deposition is a result of the return to the ground of manmade and natural materials which are added to the atmosphere. Power plants and automobiles, which burn fossil fuels such as coal and oil products, release large amounts of sulfur dioxide and nitrogen dioxide into the atmosphere. These particles are transported by the winds and can travel great distances. When they come into contact with the water droplets in clouds, chemical reactions can occur, resulting in acid deposition when it rains or snows. Studies have linked acid deposition with the deterioration of the ecosystems of lakes and forests. Acid deposition also speeds up the decay of historic buildings and monuments and damages materials such as iron, steel and paint.

What is DEP doing to monitor acid deposition?

DEP collaborates with the National Atmospheric Deposition Program to monitor acid deposition. Data is collected at sites in Truro, Waltham and Ware. Figures 7 and 8 show fifteen-year trends using the data from the three Massachusetts sites.

Is pH increasing or decreasing?

Figure 7 shows the trend from 1985 to 2000 for pH of precipitation, which is an indicator of acidity. In 1997 the pH decreased, a change from the overall trend in which pH has increased. A higher pH indicates that precipitation is becoming less acidic, which is a positive trend towards minimizing ecological and other impacts.

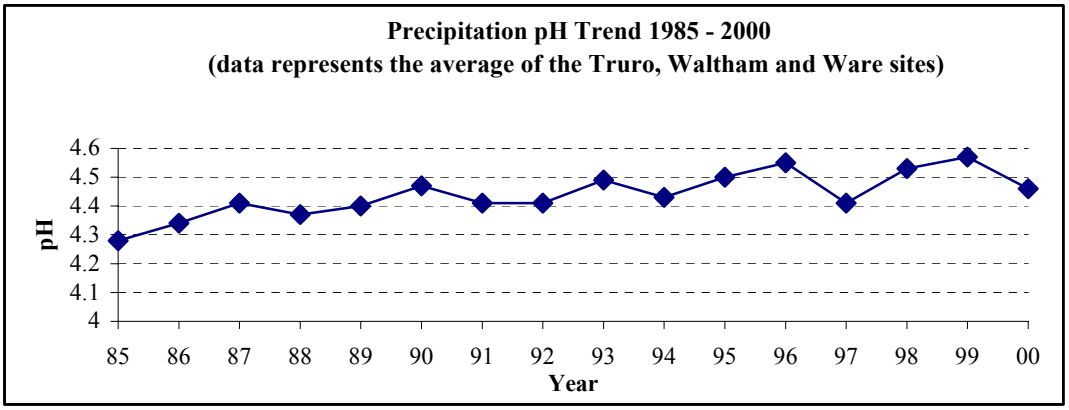


Figure 7

What are the trends for some other types of deposition?

Figure 8 shows the trends for some compounds that affect the quality of surface waters. Nitrate increases acidity and can cause algae blooms and sulfate increases acidity. The data indicates the trends are downward for sulfate and relatively stable for nitrate.

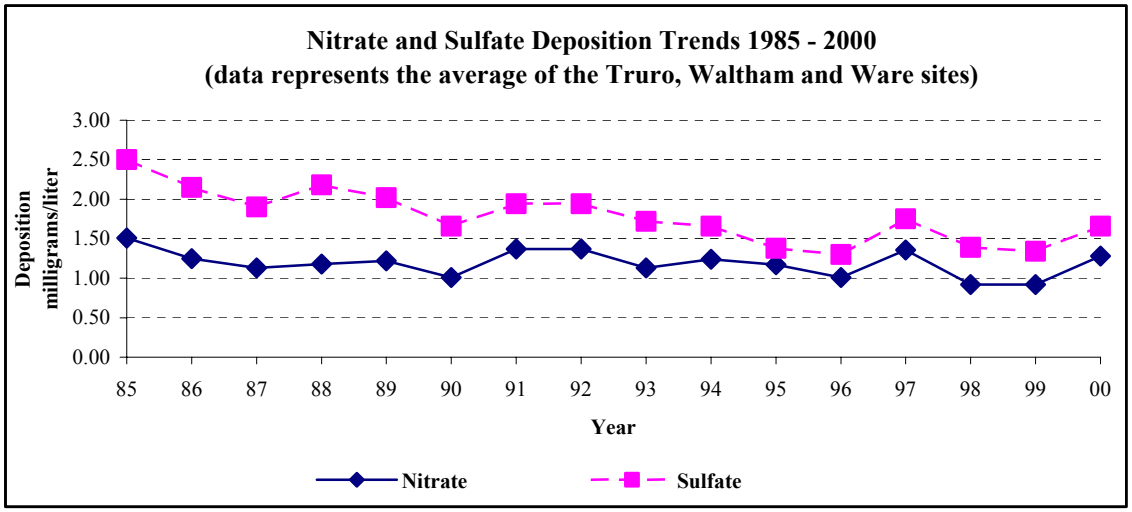


Figure 8

What is DEP doing to mitigate acid deposition?

DEP is trying to reduce acid deposition in several ways. In October 1999, Massachusetts and New York petitioned EPA to establish secondary national ambient air quality standards for sulfur dioxide and nitrogen dioxide. While primary air quality standards are set to protect public health, secondary standards are designed to protect the environment. Ambient air emission reductions needed to meet new, stringent secondary standards would help to reduce acid deposition in Massachusetts and across the nation. Massachusetts is also a signatory to the New England Governors and Eastern Canadian Premiers Acid Rain Action Plan, and intends to meets the goals of that plan, i.e., significant additional reductions in acid deposition by 2010.

For what chemicals have freshwater fish consumption advisories been issued?

Public health freshwater fish consumption advisories have been issued for:

- mercury at 85 waterbodies
- PCBs, at 16 waterbodies
- pesticides, at 3 waterbodies
- dioxin, at 2 waterbodies, and
- PAHs, at 1 waterbody.

A statewide advisory cautioning pregnant women of the possible health risks from eating Massachusetts freshwater fish containing mercury has also been issued.

2. Programs

What does DEP need to do to reduce, eliminate and/or control discharges?

The strategies DEP employs to achieve its goal of resource protection are action items that include:

- implementation of watershed-based assessment monitoring, permitting, compliance, enforcement, public outreach, and nonpoint source control
- control of inland and coastal nonpoint pollution sources, and
- improvement of wastewater treatment and management.

What is the Watershed Approach?

The main strategy employed by DEP to protect and maintain water quality is the implementation of the Watershed Approach. A phased program for watershed-based assessment, permitting, outreach and nonpoint pollution control has been adopted by BRP to address its Watershed Management goals. The program runs its full course over a five-year cycle, then repeats.

What happens in Year 1?

During Year 1, existing water resource information is reviewed and water quality issues are identified to establish the basis for planning activities in subsequent years, build local capacity and support, and identify data gaps that need to be filled. As a priority, DEP regional offices work with the watershed teams, outside agencies, groups, and the general public in order to gain insight with respect to water quality goals and use objectives for Massachusetts surface waters, and to build networks of stakeholders who play an important role in protecting these waters. Outreach to the public through the watershed teams is an integral component of the Year 1 activities.

What happens in Year 2?

During Year 2, water quality surveys are conducted including physical, chemical, biological and fish data collection efforts. These activities are conducted according to the 5-year watershed cycle in the Year 2 watersheds. The goal to fill information gaps and to collect important data for assessing our waterbodies, identifying impaired waters, developing TMDLs and ultimately to make enforcement and permitting decisions. The scope of these field assessments varies depending upon the resources available and the important water quality issues within each watershed. DEP also works through the EOEA watershed teams (see next page) to identify volunteer groups and their capabilities to assist in data collection activities.

What happens in Year 3?

During Year 3, survey data is analyzed as a prerequisite to issuing permits the following year. These include, where applicable, calculation of total maximum daily loads and an evaluation of water quality conditions to update federal 303(d) Lists and 305(b) Reports. DEP also develops a water quality assessment report for each basin during this time. These plans, which evaluate water quality on a segment-by-segment basis are used by DEP and the watershed teams to guide them in identifying potential sources of impairment. The plans also provide recommendations for additional data collection activities for DEP, other federal and state agencies, and volunteer groups serving on the watershed team.

What happens in Year 4?

During Year 4, the assessments are used and incorporated by the EOEA teams into their 5-year action plans that prioritize future actions to be taken by the team to resolve outstanding issues. DEP also independently develops an action plan to address issues under our authority. In addition, meetings with permittees are held and final wastewater and water withdrawal permits are re-issued. Dischargers in priority waters exhibiting nonpoint pollution problems are targeted for implementation of Best Management Practices (BMPs) and other control measures. DEP's Watershed Action Plans include the activities required of DEP to implement the recommendations of the EOEA Watershed Management Plan such as NPDES and Water Management Permits to be renewed, nonpoint source contracts to be issued, TMDLs to be developed (in accordance with the TMDL Strategy), as well as enforcement activities necessary to implement TMDLs.

What happens in Year 5?

During Year 5, implementation of corrective actions continues and an evaluation is made to determine how successfully the Watershed Approach has promoted improved water resource management so that adjustments can be made during the next 5-year cycle.

What is the role of the Executive Office of Environmental Affairs?

In order to ensure that a more broad evaluation of resources is employed through the Watershed Approach, the Executive Office of Environmental Affairs has hired watershed team leaders for each of the 27 watersheds in Massachusetts. The goal of those teams is to prioritize important environmental issues needing to be addressed, to build local capacity to address problems and support implementation actions, and to ensure proper outreach and coordination among the stakeholders in each watershed including participation of all state and federal agencies.

What is the Water Management Program?

DEP reviews requests to withdraw surface and groundwater in excess of 100,000 gallons per day from river basins in order to ensure that:

- new withdrawals will not cause a negative impact on those users already withdrawing water
- withdrawals will not exceed the safe yield of a water source, and
- environmental resources are not negatively impacted.

What activities occurred in 2001 for the Water Management Program?

DEP continued its efforts to enter into Consent Orders with facilities that were found to be violating Water Management Act registrations by excessive withdrawals during the 1997 through 1998 registration renewal efforts.

Since the last update on status of these cases DEP has taken the following actions:

- Nearly finalized a Consent Order for the restoration of 8 acres of wetlands with Maranatha bogs, and is negotiating the penalty phase of the case.
- Issued an NON for WMA violations
- Processed three WMA permits for a total of nine arising out of these cases.
- Assisted EPA with its investigation of Charles and Van Johnson for wetlands violations.

Five-year compliance review occurs during Year 3 of the Basin Cycle. This compliance review of 97 Water Management Program permits commenced in 1999 in the following basins: Hudson, Deerfield, Housatonic, Millers, Charles, Concord, North Coastal, South Coastal, Shawsheen, Taunton and Ten Mile.

DEP has continued to work on Registration Renewal cases. Remaining cases are all administratively problematic (poor documentation) or involve enforcement actions. Only 38 out of 933 registrations remain to be renewed.

What activities are planned for 2002 and 2003 in the Water Management Program?

Selection of basins for five-year compliance review has been reevaluated to address basins most in need of review and to better manage workload. Reviews will continue in the basins detailed above and the Merrimack basin will be added. Reviews in the Buzzards Bay, Cape Cod & Islands, Blackstone and Nashua basins will be postponed. In 2002, DEP will complete review of 137 permits. Reviews have been delayed due to lack of staff resources and continued difficulty in incorporating WMA responsibilities into regional duties. However, recent progress has been made in this area, specifically the hiring or otherwise designating staff dedicated to WMA duties, and the incorporation of the five-year reviews and review of wetlands monitoring plans associated with WMA permits into the FY 2002 Program Plan as Commissioner's Priorities. Forty permits are scheduled to be reviewed in 2003. During this review, enforcement actions will include issuance of field notices of noncompliance to parties that did not respond to DEP's orders to complete issued during the five-year review, and issuance of notices of noncompliance or higher level enforcement where DEP has determined substantial noncompliance exists with registrations and permits.

Five-year review has been underway in the Ipswich River Basin. This river is heavily impacted by groundwater withdrawals resulting in sustained low flow events and some no-flow events. A hydrologic model of the basin was created through funding by the DEP, the Department of Environmental Management and the United States Geologic Survey. This model was utilized throughout 2001, and will be further utilized to develop mitigation strategies for these withdrawal impacts. DEP is currently involved in actions with the towns of Wilmington and Reading to acquire public water supply from outside of the basin, enabling reduced reliance on sources that adversely affect the Ipswich River. These projects will require the preparation of Environmental Impact Reports (EIR). Meeting have been held to assist with the scoping of the reports and comments and project development will occur in 2002 and 2003. Flow thresholds are proposed which would result in restoration of aquatic habitat. Various recommendations for flow thresholds are being evaluated and plans to incorporate flow thresholds will advance in 2002.

What activities are planned for 2002 and 2003 in the Water Management Program? (concluded)

The Golf Course Policy, adopted in 2000, set reasonable industry standards for determining water use based on irrigated acreage, and ensures that courses which will exceed threshold volume will be required to file for a WMA permit prior to construction. The policy, in conjunction with proposed regulation changes, will also specify a filing schedule by which existing facilities exceeding the threshold volume can come into compliance. Potential cases for more immediate enforcement action have been identified and will be targeted for compliance and enforcement actions in 2002 and 2003.

The Water Management Program has drafted regulation changes that are presently undergoing internal review. Four meetings of the Water Management Act Advisory Committee were held. This committee was created by statute to facilitate policy and regulation development. At least one additional meeting of the Advisory Committee will be required. Upon finalization of draft regulations, DEP will commence the public hearing process. These regulation changes will improve the clarity of the regulations, and address problems identified by DEP during administration of the Act.

Why is the NPDES program important?

The National Pollution Discharge Elimination System (NPDES) program protects public health and the environment by the control of discharges to surface waters in Massachusetts.

What activities occurred in 2001 for the NPDES Program?

NPDES program staff continued its active participation in 2001. The focus of the program was to continue to address the "backlog" of expired NPDES permits in Massachusetts and to write permits which had expired or were due to expire in 2001 in the following watersheds: Connecticut, Chicopee, Nashua and Assabet. The program had the following main elements in 2001 many of which will also be continued in 2002:

- DEP staff continued to undertake the primary permit development responsibility for 35 NPDES permits (6 majors and 29 minors).

DEP continued to play a very active role in the Storm Water Phase 2 (SWP-2) program in 2001. This included:

- Regular meetings with EPA to develop a joint approach to develop the program (it will be a joint EPA and DEP permit program) and write the required general permits
- Review of EPA general permits
- Holding regional workshops with municipalities across the state to outline the major components of the program and to get feedback from the municipalities on their progress, problems and resource needs, and
- Establishment of a work group to develop a "generic" local by-law for storm water management which the EPA program requires the municipalities develop as a condition of their permit and storm water control program.

What activities will occur in 2002 for the NPDES Program?

DEP will continue and expand its active participation in the NPDES program. This includes: permit development, public and agency outreach on the program, primary evaluate permit needs for all permittees and applicants in 4 watersheds with a commitment to conduct such evaluations and issue permits as required for 31 permittees; an expanded participation in the development of the Storm Water Phase 2 permit program, and active oversight of the MWRA NPDES permit. Our staff will also work cooperatively with EPA permit writers on other permits by reviewing draft permits and expediting state input into the process. The EPA will also have primary responsibility for several permits with emphasis upon power plants (14 permits in various stages of development). DEP will continue to be active in power plant meetings and review of draft permits and provides technical input into the power plant permit process.

What activities will occur in 2002 for the NPDES Program?

The permits for which DEP will have primary responsibility will be for the following watersheds: Millers, Shawsheen, Islands and Parker. In addition, one permit in the French River watershed and one major permit in the South Coastal watershed will be developed. The permits are comprised of municipal and institutional wastewater treatment plants (both major and minor), industrial process treated wastewaters and selected other discharges which have the most significant environmental impact. Review of the status of the remaining permits (i.e., expired but not scheduled for re-issuance) will be part of the 2002 program. Issuance of these permits will bring the watershed current with its NPDES permit requirements. The proposed program will continue and expand a very active participation by DEP in the NPDES permit program. It will bring several watersheds current with the vast majority of their permits, will address some very old, expired permits and will continue the "team" approach to many other NPDES permits which helped facilitate significant progress in FY 2001.

DEP will continue to participate in the development and issuance of permits for several power plants in the state. DEP will expend considerable resources to develop policies and guidance documents which are needed to implement the NPDES permit program and to have the permit program and the water quality standards program complement each other.

DEP will continue to expand its work in Storm Water Phase 2 Program. The program will have the following components:

- Outreach: provide training sessions for DEP staff, transportation "MS-4s", other "non-municipal "MS-4s" (e.g. state colleges and prisons), and municipal officials on the implementation of the Storm Water Phase 2 Program.

General Permit Development:

- review the EPA general permits for the transportation "MS-4s", non-municipal "MS-4s" and construction activities 1-5 acres and,
- provide guidance to permittees on contents of the permits.

Coordinate Storm Water Phase 2 Subcommittee:

- complete local bylaw development.

Coordinate Program Communication:

- interaction and communication with DEP regional offices, and
- provide guidance to other agencies, consultants and the general public.

What activities will occur in 2002 for the NPDES Program? (continued)

Attend training sessions, seminars and conferences on the Storm Water Phase 2 Program:

- participate in local, regional and national conferences, and
- inform other staff of training opportunities.

Continue to track three communities during the program:

- develop an approach to track progress of municipalities during their involvement in the program, and
- work with community on problems during permit duration.

DEP permitting staff will continue to work with the DEP Boston Harbor coordinator on the Outfall Monitoring Science Advisory Panel. In addition, DEP actively follows the permit compliance for the "deliverables" of the MWRA NPDES permit for the Deer Island wastewater treatment plant. This includes numerous document reviews, site visits and coordination meetings with the MWRA.

What activities will occur in 2003 for the NPDES Program?

In 2003, DEP will continue its active role in the NPDES permit program. During 2002, DEP and EPA will evaluate the permits due for re-issuance in 2003 in the following watersheds: Westfield, Farmington, SuAsCo, Taunton and South Coastal. The agencies will divide primary responsibility for permit development according to available staff resources. In addition, any permits which expire during 2003 but are not part of the "2003 permit year" group will also be divided. DEP will continue its support of power plant permits, begin review of Storm Water Phase II storm water management plans submitted by MS-4's as part of a permittee's permit requirements and will continue to work on policies and regulations necessary to properly support the NPDES permit program.

Why are the Wastewater Management Programs important? How are they organized?

The Wastewater Management Programs include:

- the Groundwater Discharge Program for discharges to groundwater in excess of 10,000 gallons per day, and the Title 5 Program for on-site sewage disposal. These two programs are designed to protect groundwater and, in particular, drinking water aquifers.
- the Watershed Permitting Programs, encompassing the NPDES, Water Management, and Residuals Programs. This structure allows for better integration of activities relating to wastewater, water withdrawals, and residual disposal into the Basin Schedule.

What regulation changes are proposed for 2002?

Revisions to Title 5 Regulations will be submitted for approval by the Governor's Office, and will be sent out for public hearing and promulgation later this year. These regulation revisions have been postponed while the Governor's Affordable Housing Committee completes its report. Revisions to the Water Quality Standards will be targeted by the end of the calendar year.

What activities will occur in 2002 and 2003 for the Wastewater Management Programs?

DEP will continue to implement the comprehensive compliance strategy for the Groundwater Discharge Program developed in 2000. Like the NPDES strategy mentioned above, the groundwater strategy established minimum levels of enforcement action to be taken for violations found in inspection of facilities and for violations documented in Daily Monitoring Reports. The strategy provides clear guidance of when to take enforcement action, what action is required, establishment of protocol for review of Daily Monitoring Reports at appropriate intervals. The establishment of "enforcement threshold" criteria included in the compliance strategy.

DEP continued implementing its inspection program of large systems. These systems are subsurface sewage disposal systems with design flow in excess of 10,000 gallons per day. System inspections are required to occur according to the Basin Schedule, and the resulting reports must be submitted to DEP. Systems failing to protect public health or the environment must be upgraded. DEP is conducting enforcement actions against entities that fail to inspect their large systems, or fail to report the results.

What activities will occur in 2001 for the Wastewater Management Programs? (continued)

DEP will revisit its Reuse Policy that allows the utilization of wastewater for golf course and nursery irrigation, artificial recharge of aquifers and toilet flushing at commercial facilities. The policy establishes stringent treatment and precautions for the protection of public health and the environment. The technical advisory committee is reviewing these standards. It is anticipated that during 2002, the Reuse Policy will be revised to reflect the outcome of the technical advisory committee's review. In addition, DEP is currently evaluating and redesigning the entire industrial wastewater program.

The following wastewater management activities will continue, and will be integrated into the basin schedule:

- Identification of sewer leaks
- Identification of illegal sewer connections into stormwater systems
- Water quality assessments at all POTWs to verify self-monitoring reports and compliance with permit conditions (including residuals)
- Inspection and/or groundwater monitoring at suspected large on-site systems and groundwater discharge permit facilities
- Follow-up investigation of "hot spots" indicating wastewater sources, and
- Identification and support of innovative technologies that can be more effective or cheaper than current technology, and
- DEP is working on policies regarding phosphorous controls at wastewater treatment plants, guidance documents for the formation of wastewater districts, and guidance for Comprehensive Water Resources Management Plans.

3. Challenges for 2002-2003 and Beyond

What is DEP doing to improve the assessment of water resources in Massachusetts?

The previous sections demonstrate the need to expand the water quality monitoring and assessment programs to better address questions and concerns about the quality of the waters in the Commonwealth. Specifically, more resources are needed to collect data necessary for: the 305(b) Report; development and confirmation of impaired waters on the 303(d) List; the development of TMDLs; and assisting the watershed teams with problem and source identification. DEP conducted several activities during 2001 to better define the needs and address the issue of water quality monitoring and assessment. The following summarize those actions:

- DEP updated a workload model for state use (using the Cadmus model) to estimate the amount of resources needed to meet the expanding needs of not only the assessment and monitoring programs but all water programs as well. The challenge will be to obtain financial support for implementation.
- During 2001 DEP, through the Massachusetts Watershed Initiative, obtained funding to continue 2 staff positions in our assessment program and hire 5 new monitoring coordinators to develop and implement monitoring plans and coordinate volunteer monitoring groups. The staff are now on board and are beginning to develop monitoring plans for 2002. The challenge for 2002-2003 is to train the new staff in monitoring and assessment protocols so that they can be quickly integrated into the program activities.
- DEP obtained funding for and was able to hire seasonal help to assist in summer data collection and laboratory analytical work, also with the assistance of the Watershed Initiative. The challenge for 2002-2003 will be to obtain sufficient funding to hire seasonal help during the summer months.
- DEP, in cooperation with Mass GIS, continues the process of developing water quality assessment maps and data links, which will assist the watershed teams with problem identification and targeting limited resources to identify the source of each problem. The challenge for 2002 and 2003 will be to increase data management capability to support these activities on a continuous basis.
- DEP, through a contract with the United States Geological Survey, has developed and will soon publish by the end of the 2001 calendar year a statewide monitoring strategy that evaluates several levels of data needs and estimates the resources necessary to achieve those goals. The challenge will be to obtain the necessary resources for implementation.
- DEP has contracted with CH2M Hill (a consulting firm) to conduct a detailed evaluation of the state TMDL program, including its technical approach, listing/de-listing process, and resource capabilities. The evaluation will include recommendations for public outreach and a strategy to brief officials to obtain support for the necessary financing for expansion of the TMDL program. A Steering Committee has been established to provide recommendations to meet these goals. The challenge for 2002-2003 is to implement the recommendations made in the report.
- DEP continues to work with the Watershed Initiative Steering Committee and the Executive Office of Environmental Affairs to develop, expand, and assist the capability of volunteer monitoring organizations.

What is DEP doing to improve the assessment of water resources in Massachusetts? (continued)

- With the assistance of our four new regional nonpoint source coordinators DEP developed a nonpoint action strategy that targets impaired waterbodies in each watershed on a segment-by-segment basis. The strategies have been incorporated into our non-point source management plan and will serve as a "living" tool for use by both DEP and the EOEA Watershed teams on an ongoing basis.
- In addition, DEP is working cooperatively with the School of Marine Studies and Technology (SMAST) at UMASS-Dartmouth, on a project to define the nitrogen carrying capacity of the most sensitive embayments. The goal of this multi-year project is to develop plans to limit nitrogen inputs to levels that will not jeopardize water quality.

What are other issues facing watersheds?

A growing and significant issue is the increasing alteration of hydrology of watersheds due to increasing water withdrawals, interbasin transfers of water and wastewater, abandoned dams, and stormwater runoff associated with development. DEP has worked and will continue to work on a variety of efforts to address this issue.

Achieve Clean Water and Protect Aquatic Ecosystems
Clean Water Goal #3: No Net Loss of Wetlands
A. Self Assessment

1. Status of Wetlands Resources in Massachusetts

Why are wetlands important?

Wetlands, or wetland "resource areas" as we call them in Massachusetts, range from broad floodplains along the Connecticut and other rivers, to beach and dune systems along the coast, to bogs in southeastern Massachusetts, to freshwater and saltwater marshes throughout the state, and to the most common type of wetland in Massachusetts, the wooded swamp.

These resource areas are important to Massachusetts' citizens because they:
- provide flood control
- prevent storm damage
- protect public and private ground and surface water supplies
- prevent pollution, and
- protect fisheries, shellfisheries, and wildlife habitat.

In addition, these resource areas provide recreational and aesthetic functions that enhance our quality of life and add diversity and character to our landscape.

What are vegetated wetlands? Why are they important?

Vegetated wetlands are areas where groundwater discharges to the surface and where, under certain circumstances, surface water discharges to groundwater. This situation creates conditions that promote the growth of certain types of vegetation defined under the Wetlands Protection Act and Wetlands Regulations. The combination of hydrology and vegetation is thereby used to determine which areas are wetlands and which are not.

Vegetated wetlands may or may not border waterbodies. The following are examples of vegetated wetlands:
- freshwater swamps
- marshes
- bogs
- wet meadows, and
- salt marshes in coastal ecosystems.

Vegetated wetlands perform many important functions, including the removal of excess nutrients and contaminants from runoff and the ability to slow and retain flood waters. Conversely, in times of drought, vegetated wetlands help maintain minimum water flow levels in rivers and streams.

Vegetated wetlands provide important:
- food supplies
- shade
- cover
- breeding areas, and
- migratory and overwintering areas for many birds, mammals, amphibians, reptiles, and invertebrates

Salt marsh plants also serve as barriers between fresh groundwater and the ocean, thus protecting the quality of groundwater, and helping to dissipate storm energy and flood damage.

What other inland and coastal resource areas are protected?

In addition to vegetated wetlands, Massachusetts protects a wide range of resource areas at the land/water interface.

Inland resource areas include:

- banks
- land under waterbodies
- land subject to flooding, whether bordering waterbodies or isolated, (including the 100-year floodplain and vernal pools), and
- a riverfront area along perennial rivers and streams.

Coastal resource areas include:

- land subject to coastal storm flowage
- land beneath the ocean and salt ponds
- coastal banks
- coastal dunes
- coastal beaches (including tidal flats)
- barrier beaches
- rocky intertidal shores
- the banks and land under anadromous/catadromous[4] fish runs, and
- land containing shellfish.

What estimates exist concerning the quantity and types of wetlands?

Previous researchers have attempted to estimate the quantity and type of wetland communities in Massachusetts. One study estimated that Massachusetts had approximately 590,000 acres of wetlands in the mid-1970s, representing about 12% of the state's land area. Approximately 80% of the state's wetlands were estimated to be freshwater swampy wetland, with forested wetlands dominating at approximately 56% of the wetland resources statewide. The remaining 20% of the state's wetlands were estimated to consist of tidal wetlands, consisting primarily of salt and brackish marshes (40% of tidal wetlands) and tidal flats (37% of tidal wetlands).

[4] Anadromous fish are ocean dwellers that migrate to fresh water to spawn. Catadromous fish are fresh water dwellers that migrate to salt water to spawn.

How is wetlands data collected today? What will we learn about wetlands with the new data?

Through the DEP Wetlands Conservancy Program, Massachusetts has begun to develop the comprehensive data necessary to replace these estimates with much more exact information on current wetlands loss or gain. The Wetlands Conservancy Program has made substantial progress mapping the state's wetlands at a scale (1:5,000) that will be useful for future comparisons. To date, the Wetlands Conservancy Program has acquired color infrared aerial photographs and orthophotoquads for 100% of the state. Wetland resources are being delineated, classified, and automated as a Geographic Information System (GIS) database. Approximately 65% of the state is included in this new GIS wetland datalayer. Over 65% of the area included in the new database is mapped as upland, with approximately 35% of this area classified as wetland or open water. Approximately 205,029 acres, or 10.1% of the state in the new GIS datalayer, consists of inland and coastal wetlands (not including open water areas and their associated resource areas, such as land under water bodies and tidal flats). As more of the state is included in the GIS layer, these figures will be refined and acreage for each specific type of resource area will be calculated.

The DEP Wetlands Conservancy Program is also the first in the nation to complete a border-to-border inventory and mapping project of Massachusetts' eelgrass resources. To date, the project has identified an estimated 36,400 acres of eelgrass. This information has also been digitized as a new GIS datalayer, and will be useful as a baseline for tracking the health of this resource in the future.

This new information will assist DEP in comparing future data and measuring progress toward protecting the state's wetlands. While we know that Massachusetts' wetlands have been filled and dredged since colonial times, and various studies have estimated previous losses, we do not know the current rate of wetland loss under modern and stringent regulatory requirements.

How much wetlands are we losing?

One study, based upon soil types, estimated that freshwater wetlands in Massachusetts originally covered approximately 818,000 acres, or 16.5% of the state. The U.S. Fish and Wildlife Service estimated in 1990 that approximately 28% of Massachusetts' wetlands (defined to include inland marshes, swamps, and bogs, as well as tidal wetlands, such as salt marshes and tidal flats) have been lost since colonial times (1780-1980). A 1988 study by the U.S. Fish and Wildlife Service reported on more recent trends in southeastern Massachusetts, and estimated losses in that part of the state at approximately 150 acres per year, a rate of approximately 0.2%. More detailed information on wetland losses will be available in the future as new information is compared to the Wetlands Conservancy Program datalayer.

2. Wetlands Program

What is the significance of the Wetlands Protection Act and the river-front provisions?

Massachusetts has always been a leader in wetlands protection, starting with passage of the nation's first wetlands protection statute in 1963. Since then, Massachusetts has continually improved its comprehensive regulatory programs to ensure continued progress.

How does the Wetlands Act work?

Most recently, DEP promulgated regulations to implement the Rivers Protection Act (Rivers Act) that was passed in 1996 as an amendment to the Wetlands Protection Act. By creating a 200-foot riverfront resource area (25-foot in some densely developed areas), the Rivers Act and regulations represent an important step towards improving water quality and protecting wetland resources from nonpoint source problems along Massachusetts rivers and streams. These regulatory changes were also supplemented by the adoption of a Massachusetts Stormwater Policy (March 1997) to control stormwater runoff and associated nonpoint pollution.

Under the Wetlands Protection Act and its regulations, permit applications called Notices of Intent must be filed with the appropriate municipal conservation commission for any activity proposed within a resource area (including the riverfront resource area), or within the 100-foot buffer zone that surrounds many of the resource areas. After public notice and a public hearing, the conservation commission issues a permit called an Order of Conditions. If the project meets regulatory performance standards, the conservation commission may issue an approval; if not, the project must be denied. While conservation commissions are the primary permitting and enforcement agents under the Wetlands Protection Act, DEP reviews appeals through its four regional offices and issues Superseding Orders of Conditions as necessary. DEP shares enforcement authority with conservation commissions, and sets overall regulatory and policy directions, provides technical support and training, coordinates with state and federal agencies, and hears variance requests.

How does the Water Quality Certification Program work?

The Water Quality Certification (WQC) program is linked to the federal Clean Water Act requirement for states to certify that issuance of a federal permit will not violate state water quality standards. DEP has developed regulations that complement the U.S. Army Corps of Engineers' Programmatic General Permit for Massachusetts, as well as complement and enhance our Wetlands Protection Act. Most small projects (less than 5,000 square feet of wetland alteration) do not need an individual permit from the Army Corps of Engineers or a separate water quality certification from DEP. Larger projects, or projects with specific types of impacts, do require separate review and permitting. For example, the WQC regulations cover work in isolated vegetated wetlands, while the state's Wetlands Protection Act does not. The WQC Regulations are able to look at cumulative impacts and to require an alternative analysis that is not generally performed under the Wetlands Protection Act. The WQC Regulations also impose strict performance standards on any project that has the potential to impact Outstanding Resource Waters (identified by DEP under regulation). These include drinking water supplies and tributaries; vernal pools; and some Areas of Critical Environmental Concern, which are identified by the Massachusetts Secretary of Environmental Affairs for protection and preservation as areas of unique environmental importance.

What is the Wetlands Conservancy Program?

The DEP Wetlands Conservancy Program conducts the aerial photography, photointerpetation, and map delineation of inland and coastal wetland resource areas. The mapping of the wetland resources in Massachusetts provides an invaluable tool which will assist DEP assessing future trends in the acreage and type of wetlands. The aerial photographs also serve as a valuable tool for wetland enforcement actions.

DEP also continues to administer two additional statutes enacted early in Massachusetts' wetlands protection history. The Inland and Coastal Wetlands Restriction Acts provide permanent deed restrictions on mapped wetland areas to protect them in advance of any work being proposed or performed. These efforts have resulted in the identification and protection of approximately 46,213 acres of coastal wetland resources in 42 communities, and approximately 8,000 acres of inland wetland resources in 16 communities. Combined, these restrictions amount to 54,213 acres in 58 communities.

3. Challenges for 2002-2003

How should DEP address continued loss of wetlands resources?

Even though Massachusetts has significantly strengthened its wetlands protection program over the past 25 years and has adopted a "no net loss" goal for its wetlands, incremental, small-scale wetland losses continue to occur. Because of strict regulatory performance standards, the rate of wetland loss each year from direct alteration is most likely low. However, it is also likely that wetlands are lost each year because of undetected violations and inconsistent administration of the regulatory programs. In addition, alterations may be permitted for variance projects with overriding public interests, such as public safety improvements, public health protection (i.e., hazardous waste cleanups or landfill closures), and environmental improvements such as resource restoration. Additional "limited projects" may also be permitted for purposes such as accessing upland properties or for agricultural conversions. In cases where wetland alterations are permitted, wetlands replication (mitigation) is required at a ratio of at least 1:1. Unfortunately, a recent study has shown that many replication areas fail to meet our regulatory criteria defining success, resulting in a greater loss of wetland resources than anticipated. DEP, in conjunction with EOEA's Wetlands Restoration and Banking program, is developing more detailed wetland replication guidance for use by conservation commissions, DEP staff, and the regulated community on wetlands replication in order to improve the quality of these replication projects.

Massachusetts wetlands are also subject to degradation from a wide variety of nonpoint source pollutants and land use changes. Nearby construction may change drainage characteristics, thus altering natural water levels. Nonpoint sources of pollution, such as road runoff containing salt, sediments, and a variety of other contaminants, often find their way into wetlands.

To help restore degraded wetlands, Massachusetts has embarked on an ambitious wetlands restoration program to enhance the quality and quantity of specific wetland resources. In addition, DEP is developing and implementing a number of measures designed to combat further degradation and improve the quality of receiving waters and associated wetlands, including a stormwater policy as well as "best management practices." DEP has also reorganized its permitting, compliance and enforcement staff along watershed lines, so that the focused expertise of regional staff can be applied more readily to solving water quality and wetlands problems in each river basin. Educational and enforcement strategies are also enhanced by the closer contact between DEP staff, municipalities, and community organizations in each river basin. Finally, a 200-foot buffer zone around perennial rivers and streams was established under the Rivers Protection Act. This will allow conservation commissions and DEP to condition projects to avoid continued degradation of the state's wetland resources.

Prevent and Manage Waste

Prevent and Manage Waste Goal #1: National Air Strategy (Ensure Massachusetts citizens have clean air to breathe)

A. Self Assessment

1. Introduction

How does DEP work to provide clean air?

DEP's goal is to provide clean air, which meets all health-based air standards established by the EPA, to all cities and towns in Massachusetts. DEP uses a variety of regulatory, permitting, compliance assistance, and enforcement approaches to do the following while accommodating population and economic growth:

- reduce the emissions of ozone precursors in Massachusetts
- reduce the transport of ozone and ozone precursors into Massachusetts from out-of-state sources
- manage emissions of criteria pollutants other than ozone, and
- decrease the emissions of toxic air pollutants.

What are the standards DEP uses to provide clean air?

The Clean Air Act of 1970 authorized the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for air pollutants which threaten human health and public welfare when found in high enough concentrations over certain periods of time. These "criteria pollutants" are sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), particulate matter less than 10 microns (PM-10), particulate matter less than 2.5 microns (PM-2.5), and lead (Pb).

Table 9 lists the NAAQS. The primary standards are designed to protect public health, particularly the health of the most sensitive populations like the young, the elderly, pregnant women, and individuals with pre-existing lung and cardiovascular diseases. More than 750,000 people in Massachusetts have pre-existing lung disease. The secondary standards protect ecosystems, including plants, water, fish and wildlife, and man-made materials, such as rubber and paints, from the harmful effects of air pollution.

See Table 10 for information on the sources and effects of criteria pollutants. EPA assesses the adequacy of these standards regularly, in light of new health and scientific data, and revises them accordingly.

What is the status of the new ozone standards EPA adopted?

In July 1997, EPA revised the ozone standard from a 1-hour standard of 0.12 ppm to an 8-hour standard of 0.08 ppm. The 8-hour standard is calculated as the 3-year average of the annual fourth-highest daily maximum 8-hour concentration. In August, 2000 Massachusetts' Governor Cellucci recommended to EPA that it designate Massachusetts as non-attainment under the 8-hour standard. The Governor further recommended that the state have two non-attainment areas in eastern and western Massachusetts, with boundaries the same as under the 1-hour standard.

In 1997, EPA added a new fine particulate standard: particulate matter less than 2.5 microns (PM-2.5). These smaller (or fine) particulates are largely responsible for the health effects of greatest concern, and for visibility impairment (such as atmospheric haze which obscures scenic views). Massachusetts currently has a statewide PM-2.5 network of 22 sites in 17 cities which began operating in 1998, and will add additional sites in 1999.

The new air quality standards have been the subject of litigation, which has delayed their implementation. In February, 2001 the U.S. Supreme Court upheld the new standards but remanded them back to the D.C. Circuit Court for reconsideration of a number of legal issues. There is still no timetable for implementation of the new standards in light of the ongoing legal action.

How does DEP determine if the standards are being met?

To determine if Massachusetts meets the NAAQS, DEP's ambient air monitoring network operates with 41 sites throughout the state. DEP also has a Photochemical Assessment Monitoring System (PAMS) network with seven sites. The PAMS sites measure individual organic compounds or classes of organic compounds, some of which are toxic. DEP is facing major challenges in continuing to operate these networks while maintaining an extensive PM-2.5 network. DEP expects to work with EPA on areas where efforts can be adjusted and will be forwarding those requests to EPA New England. However, community groups have indicated in recent discussions an interest in DEP expanding its air monitoring network, due to their interest in cumulative impacts and emissions from existing and proposed power plants, even when evidence points to continued progress in reducing air pollutants covered by the NAAQS. The challenge is to balance these concerns with the need to perform assessments of statewide air quality, given technical, scientific and fiscal constraints.

Table 7: National Ambient Air Quality Standards

- **Primary Standards –** designed to protect public health against adverse health effects with a margin of safety.
- **Secondary Standards** - designed to protect against effects such as damage to vegetation and buildings.

Pollutant	Averaging Time*	Primary	Secondary
SO_2	Annual Arithmetic Mean	0.03 ppm (80 μg/m³)	None
	24-Hour	0.14 ppm (365 μg/m³)	None
	3-Hour	None	0.50 ppm (1,300 μg/m³)
CO	8-Hour	9 ppm (10 mg/m³)	Same as Primary Standard
	1-Hour	35 ppm (40 mg/m³)	Same as Primary Standard
O_3	1-Hour	0.12 ppm (235 μg/m³)	Same as Primary Standard
	8-Hour	0.08 ppm (157 μg/m³)	Same as Primary Standard
The 1-hour standard continues to apply to the entire state. To meet the 1-hour standard, no more than 3 exceedances may be recorded at any monitor during a 3-year period. An exceedance is a 1-hour concentration of .125 ppm or above. The 1-hour standard is met when the exceedance days (the daily maximum 1-hour concentration exceeds 0.12 ppm) do not exceed one per year (3-year average). The 8-hour standard is met when the 3-year average of the 4th-highest daily maximum 8-hour average does not exceed 0.08 ppm.			
Pb	Calendar Quarter Arithmetic Mean	1.5 μg/m³	Same as Primary Standard
NO_2	Annual Arithmetic Mean	0.053 ppm (100 μg/m³)	Same as Primary Standard
PM-2.5 Particulates up to 2.5 microns in size	Annual Arithmetic Mean	15 μg/m³	Same as Primary Standard
	24-Hour	65 μg/m³	Same as Primary Standard
• The annual standard is met when the annual average of the quarterly mean PM-2.5 concentrations is less than or equal to 15 μg/m³ (3-year average). If spatial averaging is used, the annual average from all monitors within the area may be averaged in the calculation of the 3-year mean. • The 24-hour standard is met when 98th percentile value is less than or equal to 65 μg/m³ (3-year average).			
PM-10 Particulates up to 10 microns in size	Annual Arithmetic Mean	50 μg/m³	Same as Primary Standard
	24-Hour	150 μg/m³	Same as Primary Standard
• The PM-10 standard is based upon estimated exceedance calculations described in 40 CFR Part 50, Appendix K. • The annual standard is met if the estimated annual arithmetic mean does not exceed 50 μg/m³. • The 24-hour standard is attained if the estimated number of days per calendar year above 150 μg/m³ does not exceed one per year.			

μg/m³ = micrograms per cubic meter **ppm =** parts per million **mg/m³ =** milligrams per cubic meter

- Standards based upon averaging times other than the annual arithmetic mean must not be exceeded more than once a year.

Table 8: Criteria Pollutants - Their Sources and Effects

Pollutants and Their Sources	Health and Welfare Effects
***Ozone (O_3)** Ground level O_3 is not emitted directly. It is a product of photochemical reactions involving nitrogen oxides and volatile organic compounds (VOC) - which are typically emitted in motor vehicle exhaust and industrial processes using solvents. O_3 is formed downwind of these sources. Warm temperatures and sunlight stimulate O_3 formation.	**Health:** O_3 is a highly reactive gas which irritates the mucous membranes and other lung tissues causing respiratory impairment. O_3 has been found to affect not only those with respiratory problems, such as asthma, but also healthy adults and children. Effects include breathing difficulty when exercising and reduced resistance to respiratory infections. Acute exposures cause bronchial constriction, lung edema, and abnormal lung development. **Welfare:** Toxic to plants causing leaf damage and decrease in growth. Weakens materials such as rubber and fabrics.
Carbon Monoxide (CO) The largest source of CO emissions are from motor vehicles resulting from the incomplete combustion of carbon in fuels. High levels of CO are possible near large parking lots and city streets with large numbers of slow-moving cars.	**Health:** CO enters the bloodstream by combining with hemoglobin which reduces the amount of oxygen carried to organs and tissue. The health threat is most severe for those with cardiovascular disease. Healthy individuals are affected at higher concentrations (> 30 ppm). Symptoms include shortness of breath, chest pain, headaches, confusion, and loss of coordination. **Welfare:** No known effect on materials or vegetation.
Sulfur Dioxide (SO_2) SO_2 results largely from coal and oil combustion in heat and power generation facilities. Other sources include pulp and paper mills, refineries, and non-ferrous smelters.	**Health:** SO_2 combines with water vapor to form acidic aerosols which irritate the respiratory tract. It aggravates symptoms associated with chronic lung diseases such as asthma and bronchitis. **Welfare:** SO_2 is a primary contributor to acid deposition which causes acidification of lakes and streams. Acid deposition also damages materials (corrodes metals, degrades rubber and fabrics), injures vegetation, and causes visibility degradation.
Nitrogen Dioxide (NO_2) NO_2 is formed from the oxidation of nitric oxide (NO). NO is generated when combustion temperatures are high. Major sources of NO are power plants and automobile engines. NO and NO_2 are O_3 precursors.	**Health:** NO_2 can lower resistance to respiratory infections and aggravates symptoms associated with asthma and bronchitis. **Welfare:** NO_2 decreases visibility by causing a reddish-brown haze. It is a contributor to acid deposition which causes acidification of lakes and streams, as well as plant injury and damage to materials (metals, rubber, fabrics).
Particulates (PM-10 and PM-2.5) Particulate matter are tiny airborne particles or aerosols which include dust, dirt, smoke, and liquid droplets. PM-10 encompasses particulate matter with an aerodynamic diameter of 10 microns or less; PM-2.5, of 2.5 microns or less. Sources include fossil fuel combustion emissions, industrial process emissions, and motor vehicles.	**Health:** PM-10 particles, because of their small size, are able to be inhaled and reach the thoracic region of the respiratory system. The health effects are often not immediately noticed. The particulates can accumulate in the lungs after long term exposure and affect breathing and respiratory symptoms. The lung's natural cleansing and defense mechanisms are impaired. **Welfare:** Causes soiling and corrosion to materials. Decreases visibility by forming atmospheric haze.
Lead (Pb) The primary source for airborne Pb used to be motor vehicles but the use of unleaded gas has dramatically reduced Pb emissions.	**Health:** Causes mental retardation and brain damage, especially to children. Causes liver disease; may be a factor in high blood pressure and damages the nervous system. **Welfare:** No direct impact on vegetation.

***Note:** Ozone at the ground level can be a health and environmental problem, but ozone is beneficial in the stratosphere (30-60 miles above the Earth) where it filters out the sun's harmful ultraviolet radiation.

2. Status
a. What Is the Quality of the Air We Breathe?

How and why are trend data used?

Trend data provide a means to address the question "How has the quality of the air we breathe changed?" As reflected in the figures on the following pages, trends indicate that air quality is improving - and very substantially for some pollutants. When interpreting trends, it must be recognized that air quality is influenced by many factors. For instance, the state of the economy, as reflected by industrial and commercial activity, and the resultant levels of pollutant emissions, as well as meteorological conditions should be considered when evaluating pollution trends. In recent years, while the Massachusetts economy has been strengthening, meteorological conditions have been favorable for lower ozone levels. With meteorological conditions more conducive to ozone formation, the pollution levels could have been higher.

How does DEP approach the goal of emission reductions?

While current data trends are downward for many pollutants, DEP believes that it is necessary to maintain and improve existing emission control programs in order to maintain these levels, and to reduce them further (to attain the ozone NAAQS, for example), and at some point it may be necessary to adopt further controls. The challenge is to effectively balance the goals of continuing emission reductions while encouraging economic growth.

b. Ozone

What is the monitoring system for ozone and ozone precursors?

Photochemical Assessment Monitoring Stations (PAMS) have been put in place to collect data to measure the concentrations of ozone and ozone precursors - the chemicals which are involved in the production of ozone. Massachusetts has two PAMS networks - one composed of five sites for the Boston area, and one with two sites for the Springfield area. One of the Boston area stations, Truro also operates as part of the Providence, RI PAMS network. Information from these sites is used to develop and assess the effectiveness of state and federal regulations designed to bring Massachusetts into compliance with state and federal air quality standards.

How often is the 1-hour ozone standard exceeded?

The 1-hour ozone air quality standard is attained when exceedances of the 0.12 ppm 1-hour standard are less than or equal to 1.0 per year at a site as averaged over a three-year period. Figure 9 shows the trend from 1987 to 2000 for the number of exceedance days (i.e., days ozone exceeded the 1-hour standard of 0.125 ppm) and total ozone exceedances for all sites. The 1-hour ozone standard was exceeded at three out of the sixteen sites at which ozone was monitored during 1999 and at one of the sites during 2000. (The standard of 0.12 ppm is exceeded when the monitor measures concentrations of 0.125 ppm or greater).

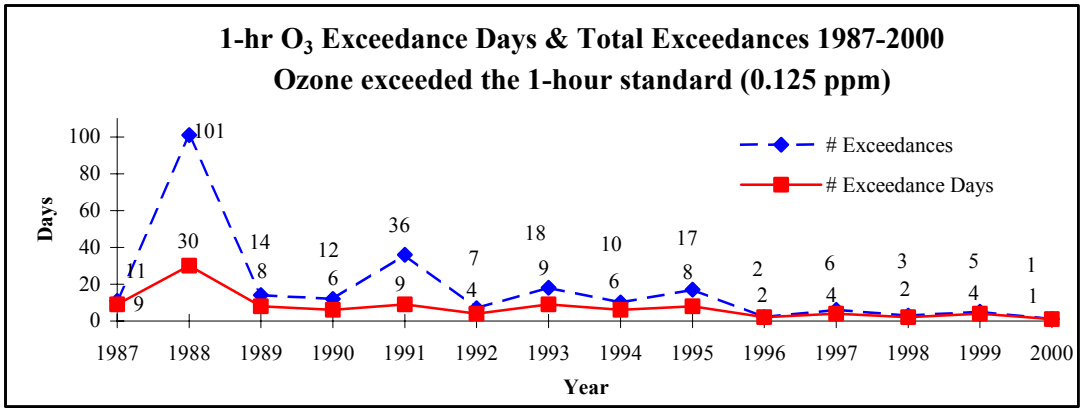


Figure 9

What has happened to peak 1-hour ozone concentrations?

Figure 10 shows that peak 1-hour ozone concentrations have generally declined during the period 1987 to 2000. Year-to-year variations in peak ozone levels are declining. Because the downward trend has persisted despite several recent hot summers, this trend appears to be the result of emissions reductions, not meteorology.

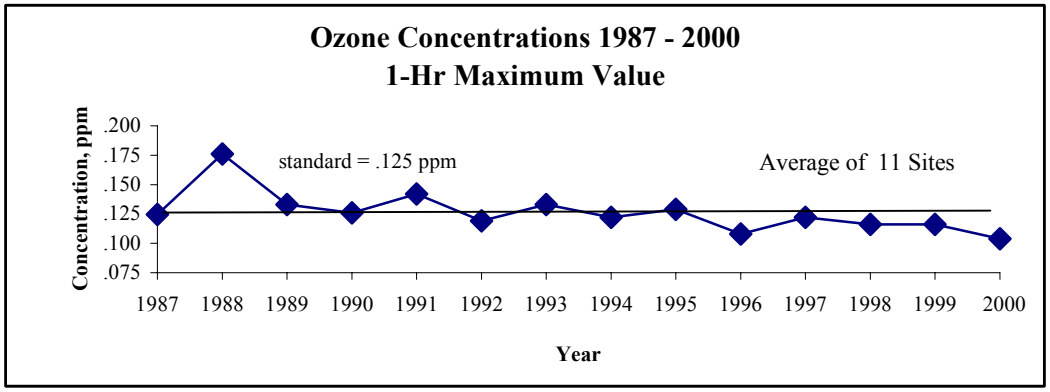


Figure 10

What is the status of the 1-hour and 8-hour ozone standards?

In July 1997, EPA revised the ozone public health standard from a 1-hour standard of 0.12 ppm to an 8-hour standard of 0.08 ppm, in light of scientific studies indicating that adverse health effects result from prolonged (6 to 8 hour) exposures to ozone at concentrations below the level of the 1-hour standard of 0.12 ppm. The 8-hour standard is designed to mitigate adverse ozone-related health effects, such as respiratory symptoms and decreased lung function. The 8-hour standard is calculated as the 3-year average of the annual fourth-highest daily maximum 8-hour ozone concentration. If this 3-year average is 0.085 ppm or greater, a site is in violation of the standard. The 8-hour standard became effective September 16, 1997.

Following the issuance of the 8-hour ozone standard, EPA revoked the one-hour standard for Eastern Massachusetts. However, in May 1999, a federal court decision prevented EPA from enforcing the new 8-hour standard. In July 2000, EPA reinstated the 1-hour standard, effective as of January 1, 2001. Both Eastern and Western Massachusetts are currently still designated as nonattainment for the 1-hour ozone standard and remain subject to that standard.

In March, 2001 the U.S. Supreme Court upheld the 8-hour ozone standard but remanded the standard back to the lower court to consider issues regarding implementation.

Figure 11 shows the number of 8-hour ozone exceedance days and total exceedances from 1987 to 2000 in Massachusetts. EPA originally intended to use data from 1997 through 1999 to determine Massachusetts' attainment status for the 8-hour ozone standard, but may use later data in light of delays in implementation of the 8-hour standard. The 8-hour standard was violated at 10 monitoring sites during the 1997-99 period and at 7 sites during the 1998-2000 period, in both Eastern and Western Massachusetts.

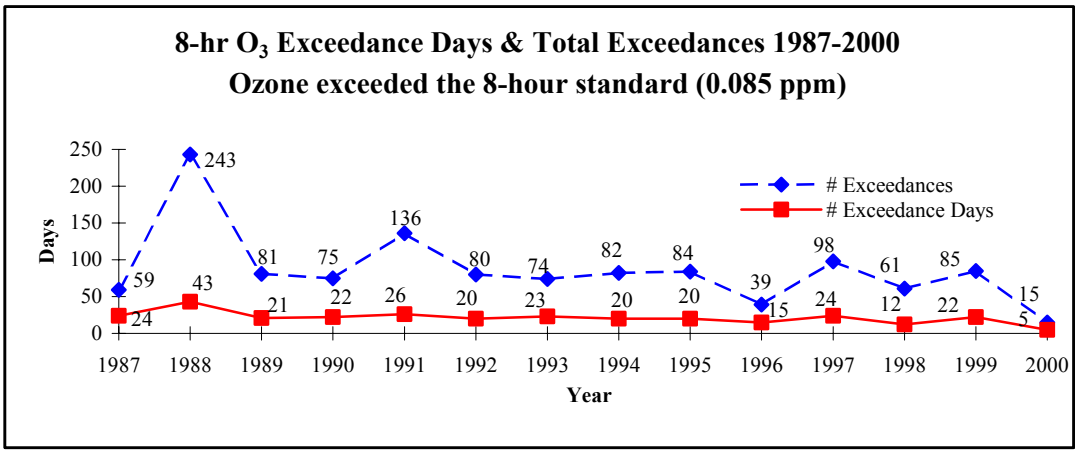


Figure 11

What is the level of transported pollution?

Ozone is a transported pollutant that is not necessarily confined to a localized geographic area. Once formed, it may travel hundreds of miles and then mix with local emissions in another area, thus contributing to a pollution problem downwind. Figure 12 shows ambient 1-hour ozone concentrations in Massachusetts and the upwind and downwind New England states for the period 1987 to 2000.

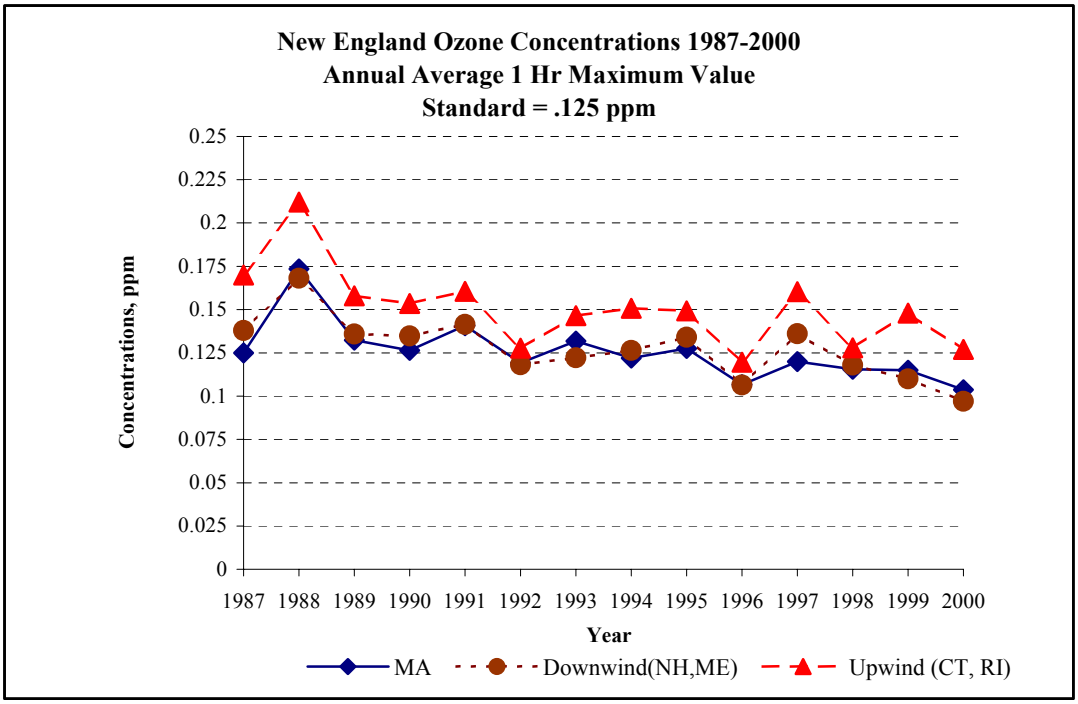


Figure 12

What actions have been initiated to limit transport?

A number of actions have been initiated recently at the state, regional and federal levels to address the issue of ozone and precursor transport. In August 1997 Massachusetts filed a petition with EPA under Section 126 of the Clean Air Act. The petition asked that EPA require NO_x emission reductions from 40 specific power plants in the Midwest that contribute to non-attainment in Massachusetts. Other states in the Northeast have also filed similar petitions under Section 126. On a regional level, the Northeast states in the Ozone Transport Region (12 states from Northern Virginia north to and including Maine, and the District of Columbia) are moving forward with NO_x reductions from power plants in 1999, with additional reductions occurring in 2003. At the federal level, in September 1998, EPA issued the "NO_x SIP Call" requiring NO_x reduction in a 22-state region covering the Eastern US. Recent court decisions have upheld the majority of the requirements of the SIP Call, but stayed the compliance deadline until May 2004. EPA also recently finalized additional NO_x and VOC reductions on a national level from mobile sources (Tier II/low sulfur gasoline) that will yield significant air quality benefits within the next 5 to 10 years.

What is the trend for violations of the one-hour ozone standard? Why is that significant?

Figure 13 shows the trend for the number of ozone sites in violation of the 1-hour ozone standard. A site is in violation when the exceedances of the 0.12 ppm 1-hour ozone standard are greater than 1.0 per year, averaged over a three-year period. Although the number of violation sites has decreased over the past ten years, exceedances of the ozone standard still occur. In 1998, in Western Massachusetts, there were three days the 1-hour standard was exceeded and one site was in violation by having a three-year average of exceedances greater than 1.0 per year. In 1999 there was one day when the 1-hour standard was exceeded in Western Massachusetts and three days when the standard was exceeded in Eastern Massachusetts. In 2000, there was only one day when the 1-hour standard was exceeded. Because ozone concentration are dependent on weather conditions, it is likely that 1-hour exceedances are likely to continue to occur from time-to-time.

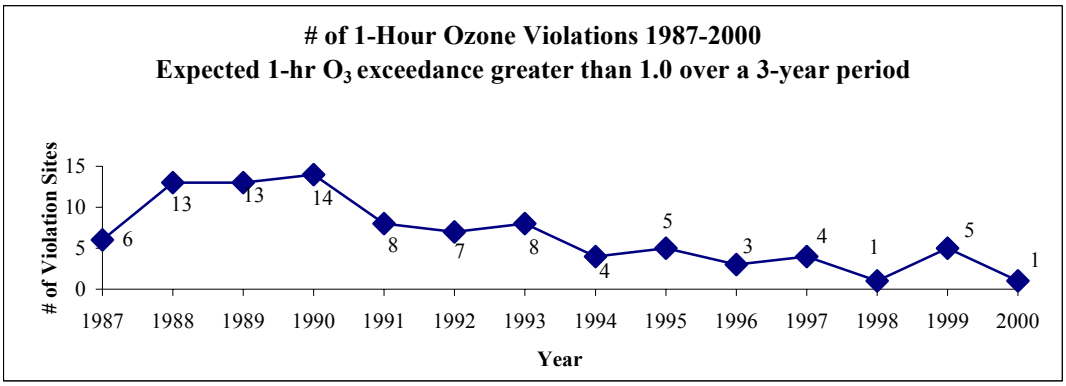


Figure 13

What is the trend for NO_x concentrations?

Oxides of nitrogen (NO_x) are key compounds in the production of ozone in the troposphere (i.e., the lower atmosphere which we breathe). Figure 14 shows the concentrations of nitrogen dioxide (NO_2), one of the oxides of nitrogen, averaged from measurements from DEP sites operational during the period 1989 to 2000. NO_2 is a criteria pollutant regulated under the Clean Air Act (see Part 4 for other criteria pollutants). A downward NO_2 trend is indicated.

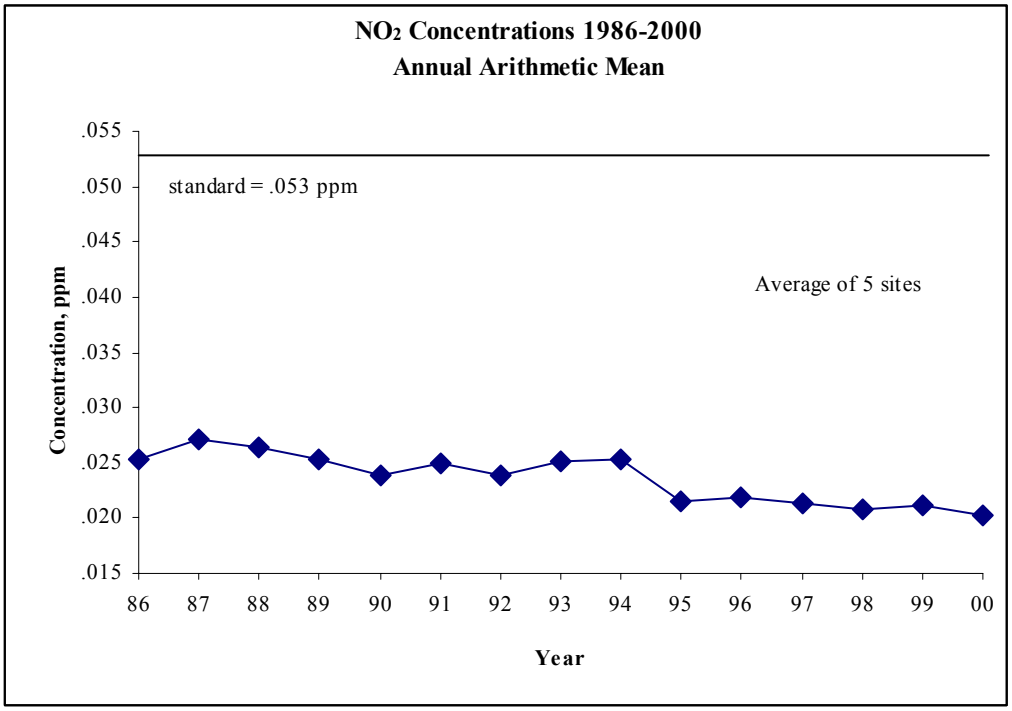


Figure 14

Is Massachusetts meeting the one-hour ozone standard? Why is that significant?

Both Eastern and Western Massachusetts are classified as being in "serious" nonattainment of the one-hour ozone standard. Western Massachusetts has had exceedances of the one-hour standard in recent years, but did not violate the standard during the 1998-2000 and 1999-2001 time periods. Eastern Massachusetts had not violated the standard since 1996. However, with more than 3 exceedences during the 1999-2001 period, Eastern Massachusetts is in violation of the standard again.

The public ambient air monitoring network, established to assess the ozone problem through field measurements, cannot measure ozone in every location in the Commonwealth. It is designed to capture values in areas that are representative of the problem, area-wide.

The monitoring data for the period 1987 to 2000 indicate a downward trend in one-hour ozone values, number of one-hour ozone exceedances, and number of violations. The trend has been relatively stable, except for 1988 when meteorological conditions contributed to a high number of exceedances of the one-hour ozone standard.

c. Criteria Pollutants Emissions Inventories

What are the emission performance trends from 1990 to 1999?

Emissions trends are presented for four major pollutants of concern: volatile organic compounds (VOC), nitrogen oxides (NO_x), sulfur dioxide (SO_2) and carbon monoxide (CO). Emissions data are not available for particulates and lead. The emission trends cover the period of 1990 to 1999. Massachusetts is required to submit periodic emissions inventories for inclusion in its State Implementation Plans to EPA for VOCs, NO_x and CO.

One initial SIP requirement was a 1990 base year emissions inventory for ozone precursors and CO, from which control programs were developed. Emission inventories are required to be submitted every three years to EPA. The 1990, 1993, 1996 emissions estimates, were submitted to EPA as part of the SIP process. The 1999 periodic emissions inventory is still under development and emissions reported here reflect preliminary estimates.

Sulfur dioxide emissions are tracked annually by DEP because of the requirements of the 1985 State Acid Rain (STAR) program. The STAR program is more stringent than the national program because it imposes an emissions cap of 412,000 tons, which is based on the average annual emissions during the four year period of 1979 - 1982. If this cap is exceeded, DEP is required to implement additional control measures. The SO_2 cap has never been exceeded in the state since the inception of the STAR program. The SO_2 emissions for 1999 were 148,000 tons, less than one-half of the cap.

What are the point source emission trends from 1990 to 1999?

The point source section of the inventory comprises the large industrial emitters and is the only category for which actual data are available for all nine years. The point source emissions are presented in Figure 15 and Figure 16 on the next page. The electric utility emissions (Figure 17 on the next page) are presented because they comprise the major proportion of NO_x and SO_2 point source emissions.

Definitions for sources of pollution described in Figures 15 through 19.

Point: A larger source of air pollution, primarily from smokestacks at manufacturing and power plants.
Area: Small point sources too numerous to measure individually, such as those found in gas stations, dry cleaners and consumer products. Taken in the aggregate they may cause a great deal of pollution.
Mobile: Common on-road vehicles such as autos, trucks, motorcycles and buses.
Non-Road: Engines that are usually not operated on a road, such as construction equipment, boats, snowmobiles, lawnmowers, etc.

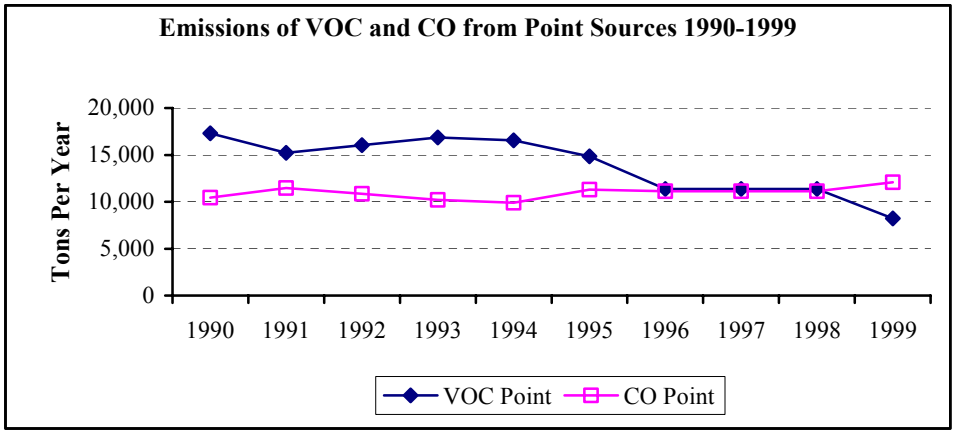


Figure 15

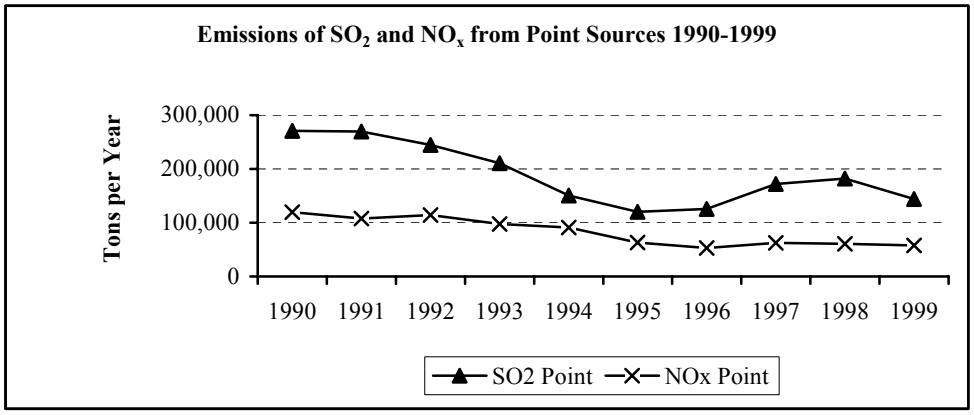


Figure 16

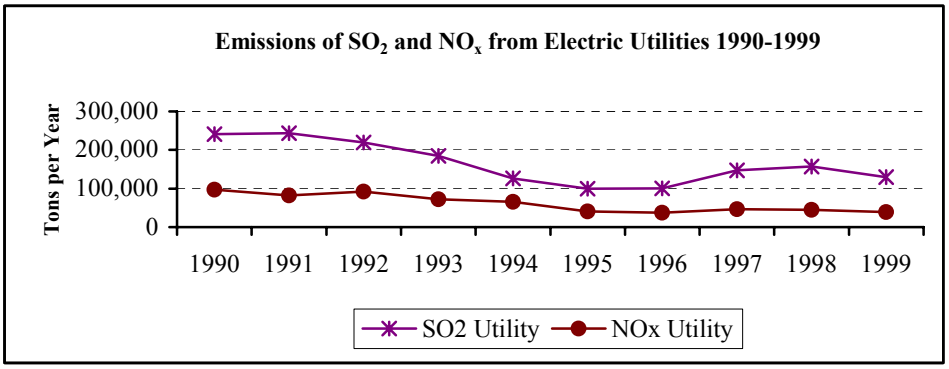


Figure 17

What is the reduction in Total VOC Emissions?

Total VOC emissions were reduced from 986 tons per summer day (TPSD) in 1990 to 748 TPSD in 1999 (Figure 18). This 24% reduction was projected to occur net of economic and industrial growth, and is based on the 1990 to 1999 controls that DEP expected to implement to meet the first set of milestone reductions required under the 1990 Clean Air Act Amendments.

The 1999 emission estimates for VOC and other precursors are based on projected controls from all programs that were included in the Reasonable Further Progress SIP revision, which required reductions by 1996. Although implementation of the Enhanced Inspection and Maintenance Program for motor vehicles began in December 1999, the 1999 emissions do not reflect reductions from this program.

The emission reductions are also attributable to other control measures such as: Federal Motor Vehicle Control Program (FMVCP); California Low Emission Vehicle Program (LEV); Reasonable Available Control Technology (RACT) corrections for point sources; Stage II vapor recovery for gasoline stations; reformulated paints and consumer products; and reformulated gasoline.

Overall, there is a general reduction in emissions for all four pollutants from 1990 to 1999, even though there has been significant growth in population and economic activity and vehicle miles traveled in Massachusetts. Based on preliminary 1999 estimates, the estimated reductions in total statewide emissions for each of the following pollutants from 1990 to 1999 are:

VOC.....-24% (see Figure 18)
NO_x.....-6% (see Figure 19)
SO_2.....-46%
CO.....-21%

Note that 1999 emissions for VOC, NO_x, CO, and SO_2 are preliminary estimates. Actual emissions are reported in periodic emissions inventories that are developed every three years. Critical data to develop the inventory are not compiled and released (e.g., State Energy Data Reports and County Business Patterns) until one to three years after the end of the calendar year analyzed.

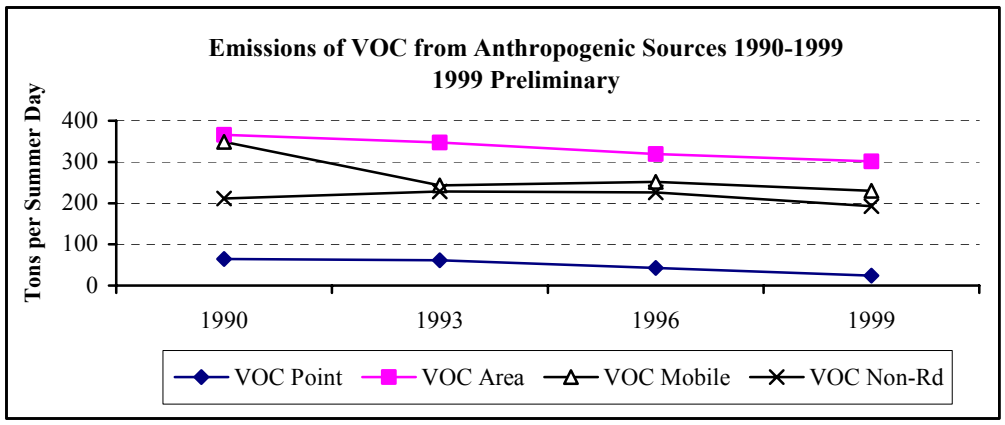


Figure 18

What is the reduction in total NO_x emissions?

NO_x emissions (Figure 19) have been reduced from 1,014 TPSD in 1990 to 950 TPSD in 1999 based on the preliminary 1999 inventory estimates. This 6% reduction is attributable to point sources. Point source emissions, primarily electric utilities, were reduced by 44% for this period. Area, mobile, and non-road emissions increased by 6%, 8%, and 17% respectively. The increase in mobile emissions is attributable to the 15% increase in vehicle miles traveled. Also, the 1990 to 1999 area and mobile source controls targeted VOC emissions, and therefore had little effect on NO_x emissions. NO_x controls for mobile sources have been put in place more recently, and their effect will be reflected as the vehicle fleet turns over.

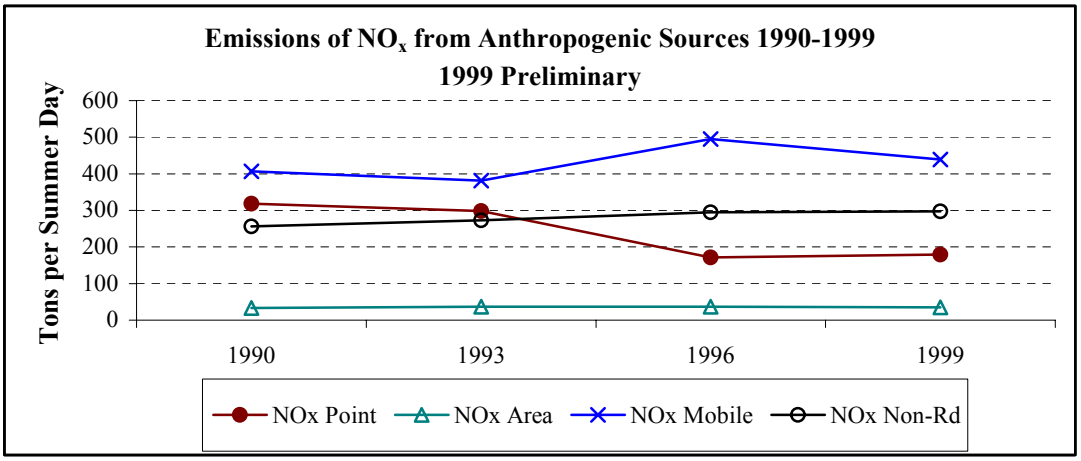


Figure 19

What is the reduction in on-road mobile source emissions?

Reductions of on-road mobile VOC emissions are shown (Figure 20) with a contrasting increase in daily vehicle miles traveled (DVMT). The increase in mobile NO_x emissions is due to the fact that controls in the past have been targeted at VOC reductions. Mobile source NO_x controls were put in place recently and reductions should occur with vehicle fleet turnover. The increase in DVMT is also responsible for emissions increases. The projected emissions from 1990 to 1999 are:

VOC.....-34%
NO_x .....+8%
DVMT.....+15%

On-Road Mobile Emissions and Daily Vehicle Miles Traveled 1990 – 1999 (1999 preliminary)

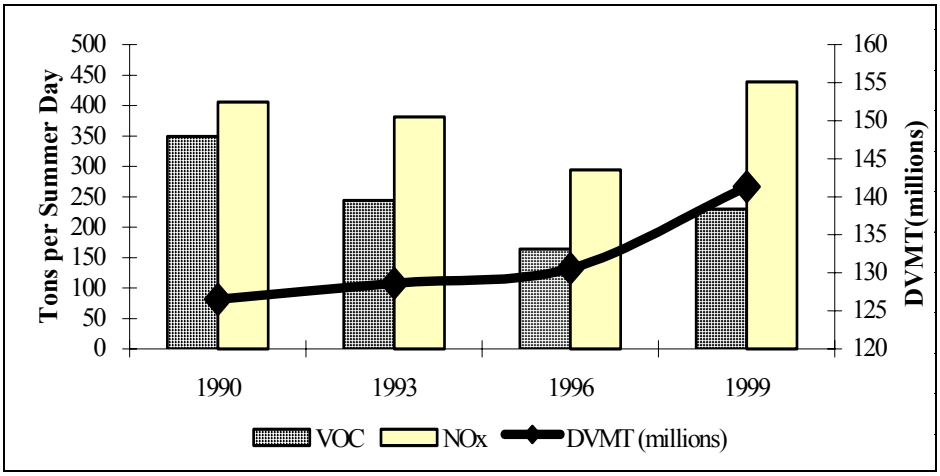


Figure 20

d. Monitoring of Criteria Pollutants other than Ozone.

What is the trend for carbon monoxide?

The trend for carbon monoxide (CO) displayed in Figure 21 fluctuates but is clearly in a downward direction. CO, as indicated by the 8-hour 2nd maximum concentration, has decreased by 54% in the period indicated below. CO concentrations and statewide emissions have greatly decreased because of implementation of controls on vehicles by DEP and EPA, even though CO emissions have increased slightly from point sources. While it is always possible that extraordinary circumstances may cause a local condition to result in a violation of the carbon monoxide standard, monitored data supports the premise that the entire state of Massachusetts is below the standard. The Boston area was designated "attainment" on January 30, 1996. Massachusetts has submitted a request to EPA to re-designate to "attainment" the Waltham, Lawrence, Worcester and Springfield areas. With this request, the entire Commonwealth will be in attainment of the CO standard.

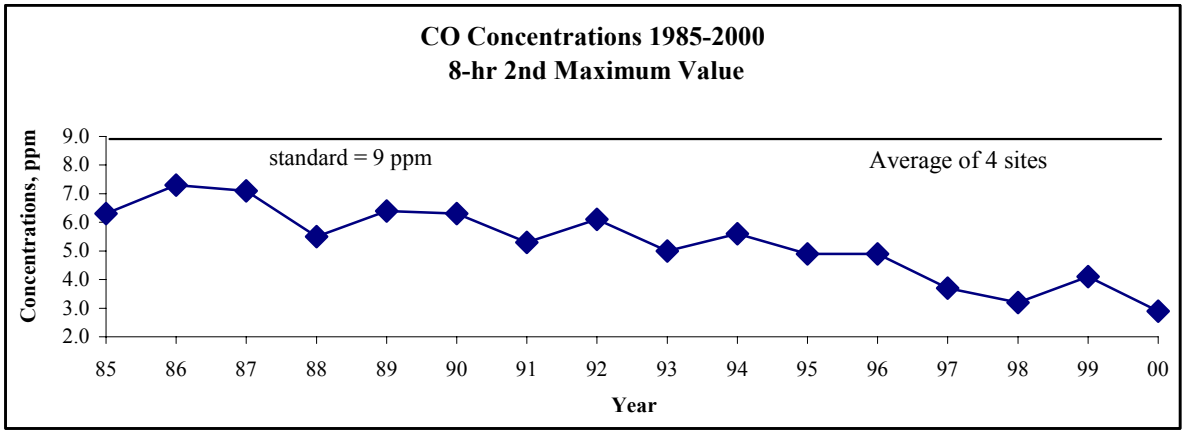


Figure 21

What is the trend for nitrogen dioxide?

The trend for Nitrogen Dioxide (NO_2) shown in Figure 22 is downward. The annual mean concentration has decreased 20% in the period indicated below. Massachusetts attains the NO_2 standard.

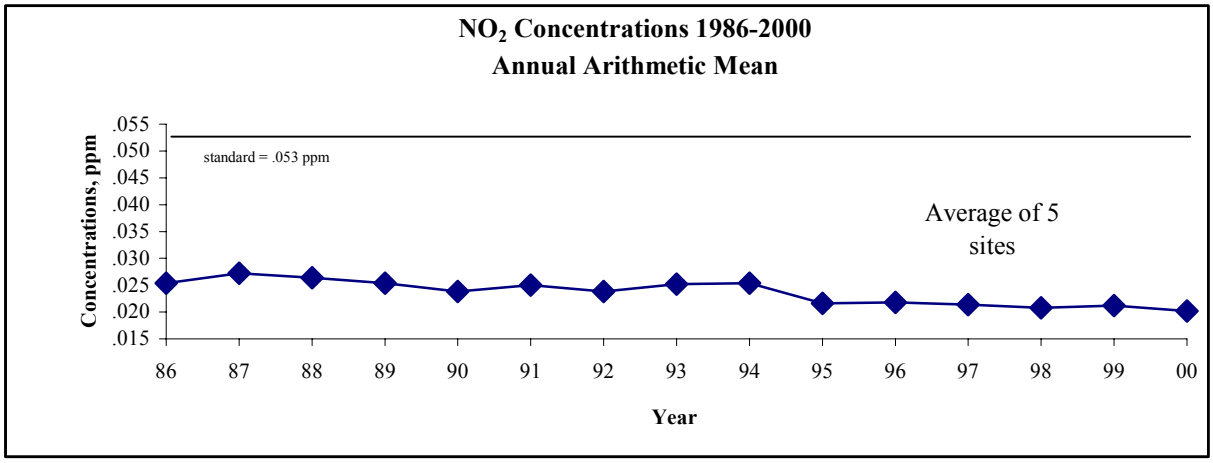


Figure 22

What is the trend for sulfur dioxide?

Figure 23 indicates a downward trend in sulfur dioxide (SO_2) with the annual mean concentration decreasing 38% over the period indicated below. The slight increase over the past few years may be attributed to an increase in fossil fuel-fired operations, or changes in local or regional meteorology. Massachusetts attains the SO_2 standard.

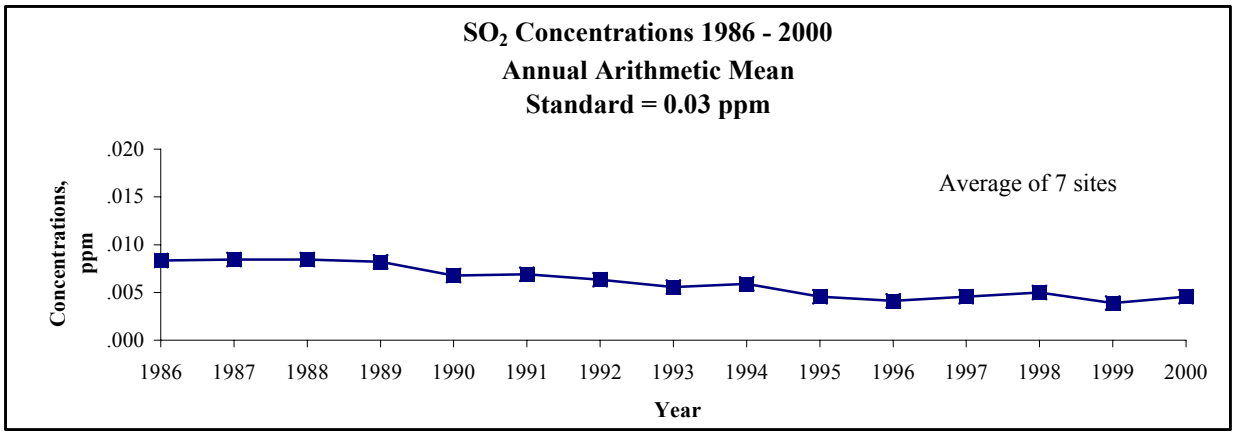


Figure 23

What is the trend for particulate matter?

The PM-10 trend shown in Figure 24 is downward. PM-10 concentrations have decreased 21% over the period indicated below. Massachusetts attains the PM-10 standard.

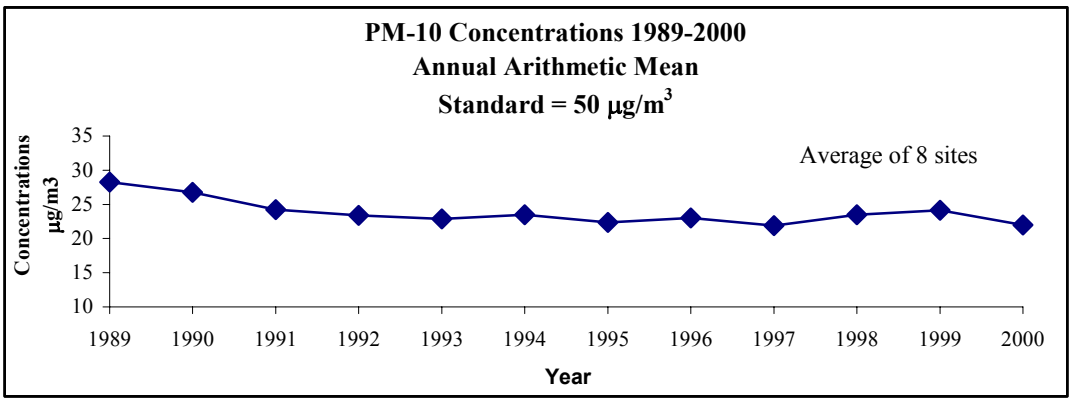


Figure 24

What is the trend for particulate matter? (continued)

Figure 25 shows trends indicating a decrease in PM-10 in Massachusetts in the last decade, and also in the New England states, which are upwind and downwind from Massachusetts.

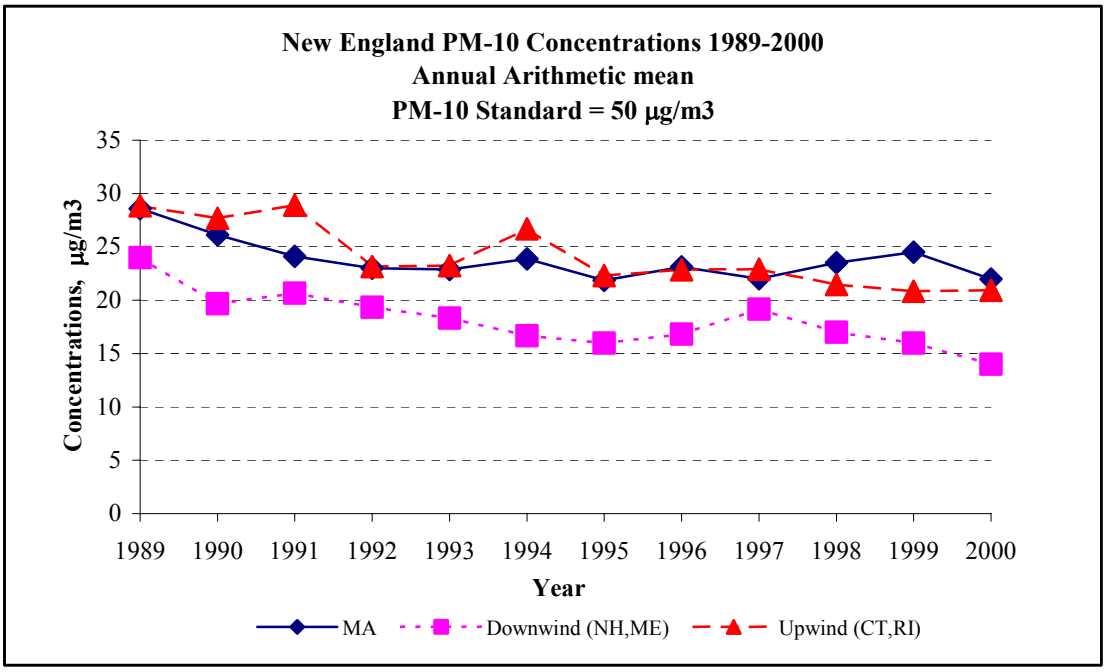


Figure 25

What is the trend for lead?

Lead (Pb) as an air contaminant has been virtually eliminated as an ambient air problem. This is most directly due to the elimination of tetraethyl lead as a gasoline additive. Data from 1993 through 1995 are reporting levels at the lower detectable limit of our analysis. The actual lead in air concentrations could therefore be less. As Figure 26 indicates, the concentration of lead in the air decreased dramatically over the period 1986 to 1995. Lead sampling was discontinued in 1995, but was reestablished at one site in 1998. Concentrations at that site, in Boston, are well below the standard.

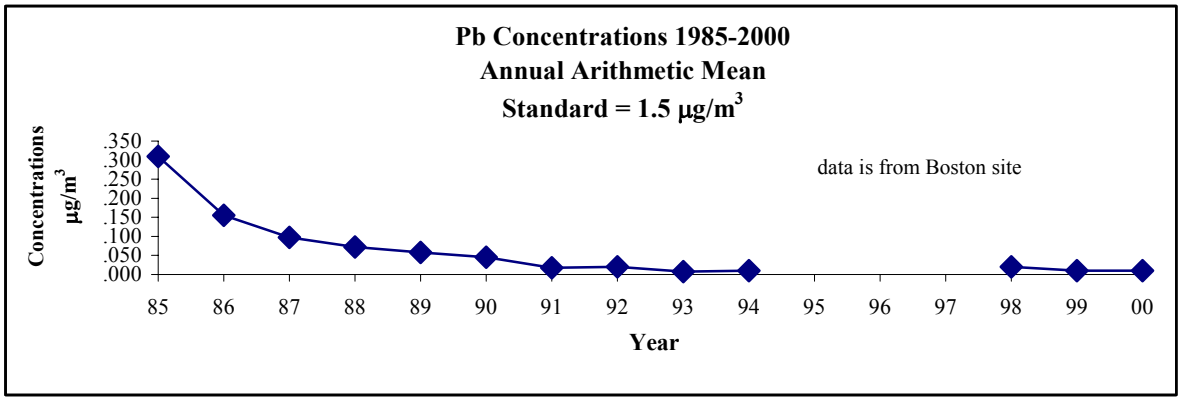


Figure 26

e. Emissions and Deposition of Toxic Air Pollutants

What are toxic air pollutants?

Toxic air pollutants are pollutants that, at sufficient concentrations and exposure, are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or to cause adverse environmental effects. Generally, the toxic air pollutants of greatest concern are those that are released to the air in amounts large enough to create a risk to human health, and have the potential to expose many people.

Title III of the Clean Air Act Amendments identified 188 hazardous air pollutants (HAPs). The 188 HAPs consist of toxic air pollutants likely to have the greatest impact on ambient air quality and human health even when their emissions are controlled through available technology. The list of HAPs regulated by EPA is published in Section 112 of the 1990 Clean Air Act.

Toxic air pollutants may exist as particles or vapors. Examples of gaseous toxic air pollutants include: benzene, toluene, and xylenes, which are found in gasoline; perchloroethylene, which is used in the dry cleaning industry; and methylene chloride, which is used as a solvent by a number of industries. Examples of air toxics typically associated with particles include: heavy metals such as cadmium, mercury, chromium, and lead compounds; and semivolatile organic compounds such as polycyclic aromatic hydrocarbons (PAHs), which are generally emitted during the combustion of wastes and fossil fuels.

What are the effects of toxic air pollutants?

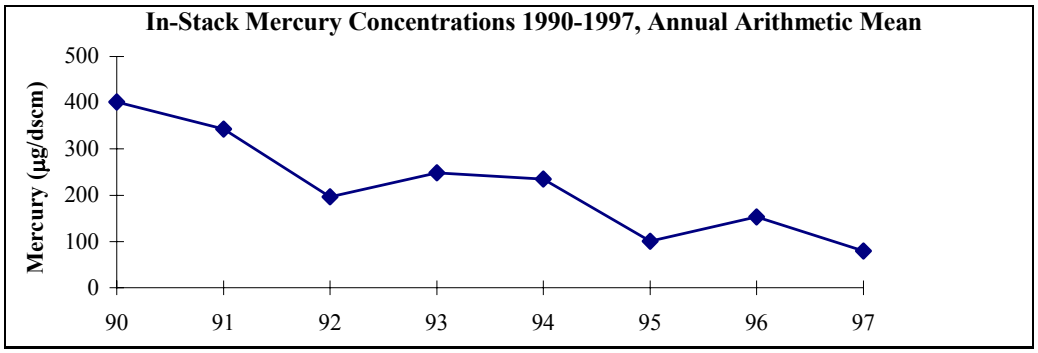
Toxic air pollutants can have serious effects on human health and the environment. Human exposure to these pollutants can include short-term (acute) and long-term (chronic) effects. Many factors can influence how different toxic air pollutants affect human health, including the quantity to which a person is exposed, the duration and frequency of the exposure, the toxicity level of the pollutant, and the person's overall health and level of resistance or susceptibility. Short-term exposures can include effects such as eye irritation, nausea, or difficulty in breathing. Long-term exposures may result in damage to the respiratory or nervous systems, birth defects, and reproductive effects. In addition, certain toxic air pollutants can have indirect effects on human health through deposition onto soil or into lakes and streams, potentially affecting ecological systems and, eventually, human health through consumption of contaminated food.

What toxics monitoring does the DEP do?

DEP collects 24 hour air samples in Summa type canisters at two locations, the Roxbury and Long Island monitoring stations. These canisters are sent to the Rhode Island DPH where they are analyzed for a number of urban air toxics. In addition, DEP has applied for a 103 National Air Toxic Monitoring grant that would allow DEP to contract with a consulting firm for the analysis of existing PAMS data, for toxics data information, as well as to offer assistance in the development of future toxic monitoring efforts.

Why is mercury in the environment such a concern? What is the trend for mercury?

Mercury is of great concern to DEP because it has been spread widely throughout the environment, does not decay, and can travel up the food chain to potentially cause very serious health effects in children and adults who are exposed. It is released into the atmosphere by various sources, including facilities that burn fossil fuel, municipal waste combustors, and medical waste incinerators. Municipal waste combustors were the largest source of mercury emissions in Massachusetts through the 1990's. Figure 27 shows the in-stack concentration from Massachusetts facilities over the past seven years. The figure shows a downward trend of mercury over time. This in part is attributable to recycling programs and less mercury in products.



µg/dscm = micrograms per dry standard cubic meter

Figure 27

What steps is DEP taking to control mercury emissions?

DEP has developed a comprehensive mercury reduction and elimination strategy. Addressing air emissions through pollution control equipment is one core DEP strategy. The air-related regulations are described below in this section. The second core of the strategy is pollution prevention. This includes diverting mercury out of the waste stream through means such as recycling and source substitution. Massachusetts is also a signatory to the New England Governors and Eastern Canadian Premiers *Mercury Action Plan*, and intends to meets the goals of that plan.

For additional information on DEP's mercury pollution prevention programs in Massachusetts, please refer to Prevent and Manage Waste Goal #2, Pollution Prevention.

Section 129 of the 1990 Clean Air Act Amendments required EPA to promulgate emission limits to control mercury, cadmium, lead and other pollutants from municipal waste incineration units. Those emission limits were promulgated in December 1995. To implement these limits, DEP promulgated a regulation [310 CMR 7.08(2)] in August, 1998 to control emissions from municipal waste combustors. It sets a mercury standard almost three times more stringent than the federal standard. Municipal waste combustors had until December 2000 to install controls. With these new controls installed on the incinerators, stack emissions of toxic chemicals, in particular of mercury, have been significantly reduced. Preliminary monitoring data indicates that mercury emissions have been reduced by more than 90%. DEP is planning to promulgate regulations for medical waste incinerators in the fall of 2001. These regulations will also be more stringent than federal requirements. The number of medical waste incinerators in Massachusetts has substantially decreased through mergers, closures of hospitals and other facilities, and use of alternative sterilization technologies. A pre-1994 inventory counted upwards of 212 permitted facilities. Currently, the 2000 inventory stands at approximately 4 facilities, down from 23 in 1998.

What has DEP done to monitor mercury?

A special mercury air deposition monitoring program was established in coordination with EPA and NESCAUM at the Quabbin Reservoir in June 1997. Particulate mercury, wet deposition mercury, and elemental mercury were measured at the Quabbin monitoring site. The measured values will provide us with information on the amount of mercury deposition into this waterbody. A program report will be forthcoming. During the spring of 2001, DEP established two additional mercury monitoring stations. These stations are located in North Andover and Lakeville. Collected samples are sent to the University of Michigan for analysis. DEP's strategic monitoring program for mercury was expanded in 2000 to include a long-term monitoring plan of mercury in fish and other biota, water, and sediments from selected waterbodies from across the state. Mercury levels in wastes are also being monitored through the testing of "inlet" (pre-pollution controls) gases at municipal solid waste combustors.

What are mercury levels in freshwater fish?

Massachusetts has surveyed contaminants in freshwater fish since 1983, focusing primarily in areas of known or suspected contamination, or where biological effects were observed. These studies have shown that the variation in fish mercury contamination is relatively high in surface waters. Based on over 1,300 fish samples which have been tested, the overall mean mercury concentration is 0.36 parts per million (ppm) of mercury. The range of this mean is nondetectable to 5.0 ppm. An alternative range is 0.01 to 2.3 ppm when the single outlier of 5.0 ppm and the single nondetectable level are not included in the data set. The nondetectable level for mercury in the Massachusetts data comes from the early set, when mercury analysis was a relatively new technique. The high value of 5.0 ppm is derived from a fish taken from a waterbody that was contaminated with mercury from a hazardous waste site.

The state running average concentration of mercury of 0.36 ppm in freshwater fish represents all the fish that have been tested. These fish vary in size and species. Bass and yellow perch typically have higher mercury concentrations than the bullhead. Over 40% of the waterbodies tested have one or more species of fish with mercury levels high enough to render them unsafe. Based on the test results, the Massachusetts Department of Public Health (MA DPH) has issued over 100 freshwater fish consumption advisories for specific waterbodies. In addition, MA DPH has issued a statewide health advisory cautioning pregnant women, women who may be pregnant, nursing mothers and children under 12 to avoid eating fish from Massachusetts freshwater bodies, excluding stocked and farm-raised fish, and several species of saltwater fish.

In May 1997, DEP published a study entitled *Fish Mercury Distribution in Massachusetts Lakes*, which explored factors which might account for variation in fish mercury concentrations such as ecological subregions, fish species, lake productivity, trophic status, etc. This study found that bottom-feeding brown bullhead generally had the lowest mercury concentrations (mean = 0.14 ppm; range = 0.01 - 0.79 ppm); yellow perch (mean = 0.31 ppm; range = 0.01 - 0.75 ppm) had higher levels and largemouth bass had the highest concentrations (mean = 0.40 ppm; range = 0.05 - 1.1 ppm). Mercury concentrations measured in yellow perch and largemouth bass were consistent with those of similarly aged fish in the Adirondack Mountains of New York State, the Upper Peninsula of Michigan and Wisconsin. The largemouth bass concentrations were less than those of this species in Florida.

What are mercury levels in freshwater fish? (continued)

Another important finding of the study was the differences in fish mercury concentrations between ecological subregions in Massachusetts. Regionally, the Narragansett/Bristol Lowlands subecoregion and the Green Mountain/Berkshire Highlands subecoregions had somewhat lower mercury in all species than those from the Worcester Monadnock Plateau subecoregion (Figure 28).

Mercury Levels in Fish
(samples collected in the fall of 1996)

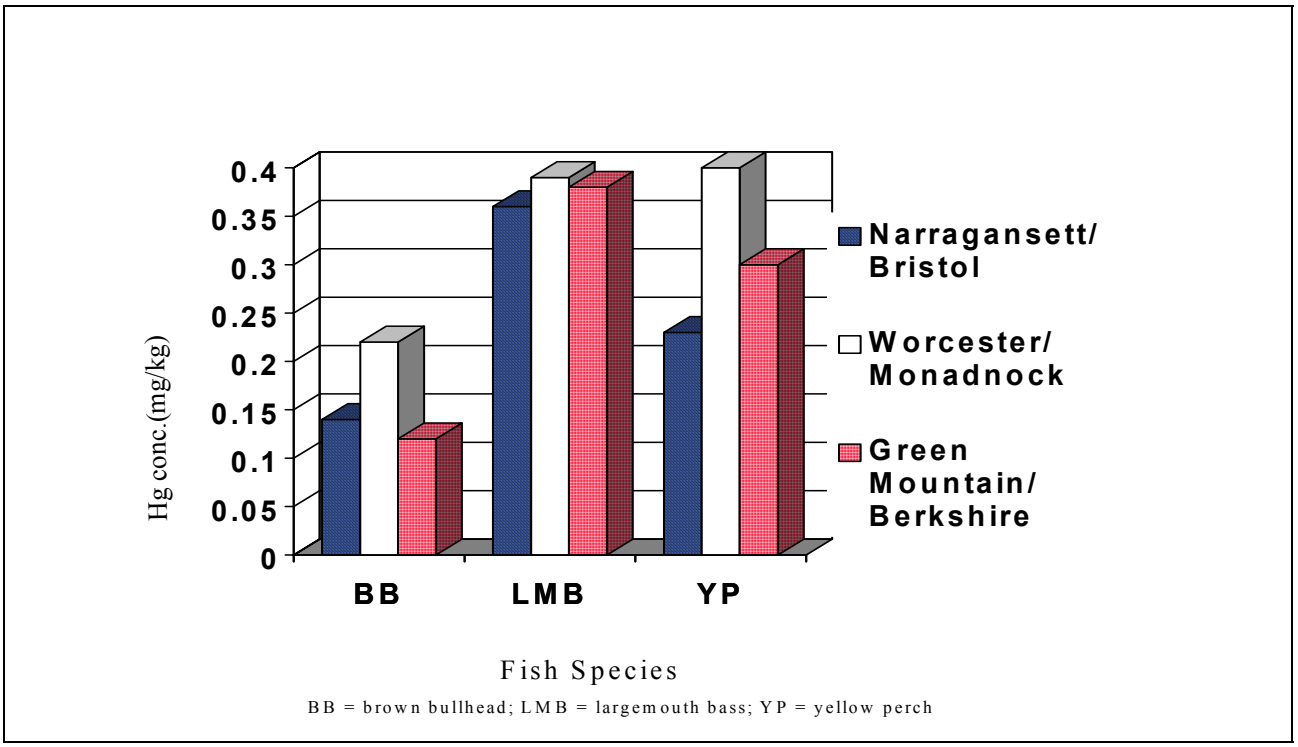


Figure 28

What is the Merrimack Valley Fish Study?

In 1997, a sophisticated computer model was used by the US EPA to predict the rate at which mercury is deposited from the air onto land and water surfaces across New England. The model predicted elevated mercury deposition in an area extending from the Merrimack River Valley of Massachusetts into southern New Hampshire and Maine. The model assessed mercury-bearing emissions from sources outside of New England (e.g., coal-fired utilities in the Midwest) and within the region (e.g., municipal waste combustors, medical waste incinerators, and other combustion facilities).

Based on these modeling predictions, as well as numerous public requests for additional fish sampling in the Merrimack River Valley, DEP expanded its ongoing fish testing program to include a regionally targeted research study in 1999. This study of 25 water bodies was primarily to determine if new fish consumption advisories and additional public outreach were needed in the region. DEP will also use the data on mercury levels in fish as an environmental indicator for assessing the long-term impacts of ongoing state and regional efforts to reduce mercury emissions.

In July 1999, the findings of the study led the MA DPH to issue freshwater fish consumption advisories for 21 waterbodies in the Merrimack Valley and for one for a waterbody in another location.

DEP is continuing to evaluate the data to compare levels in the state with other regions in the state and determine if there are spatial patterns in fish mercury concentrations within the predicted high deposition zone. In addition, DEP will use the data from this study to evaluate the accuracy of a model it developed in 1996 to predict mercury levels in fish based on measures of water quality. Follow-up monitoring of selected lakes included in the study is occurring to improve the information on seasonal and long-term fish mercury trends.

What is the most recent air toxics data from DEP's Photochemical Assessment Monitoring Station?

Figure 29 shows ambient concentrations for 1994 - 2000 from the PAMS (Photochemical Assessment Monitoring Station) site located in Lynn for benzene, toluene, ethyl benzene and xylenes. The concentration results are from 24-hour samples taken throughout each year. The figures list the allowable ambient limits (AALs) which are state health protection guidelines for long term exposures. The ambient concentrations of these compounds are well below the AALs except for benzene. However, the benzene levels have significantly decreased over the six-year period, which is likely the result of control strategies that have been implemented. These include reformulated gasoline and the adoption of the California Low Emission Vehicle Program.

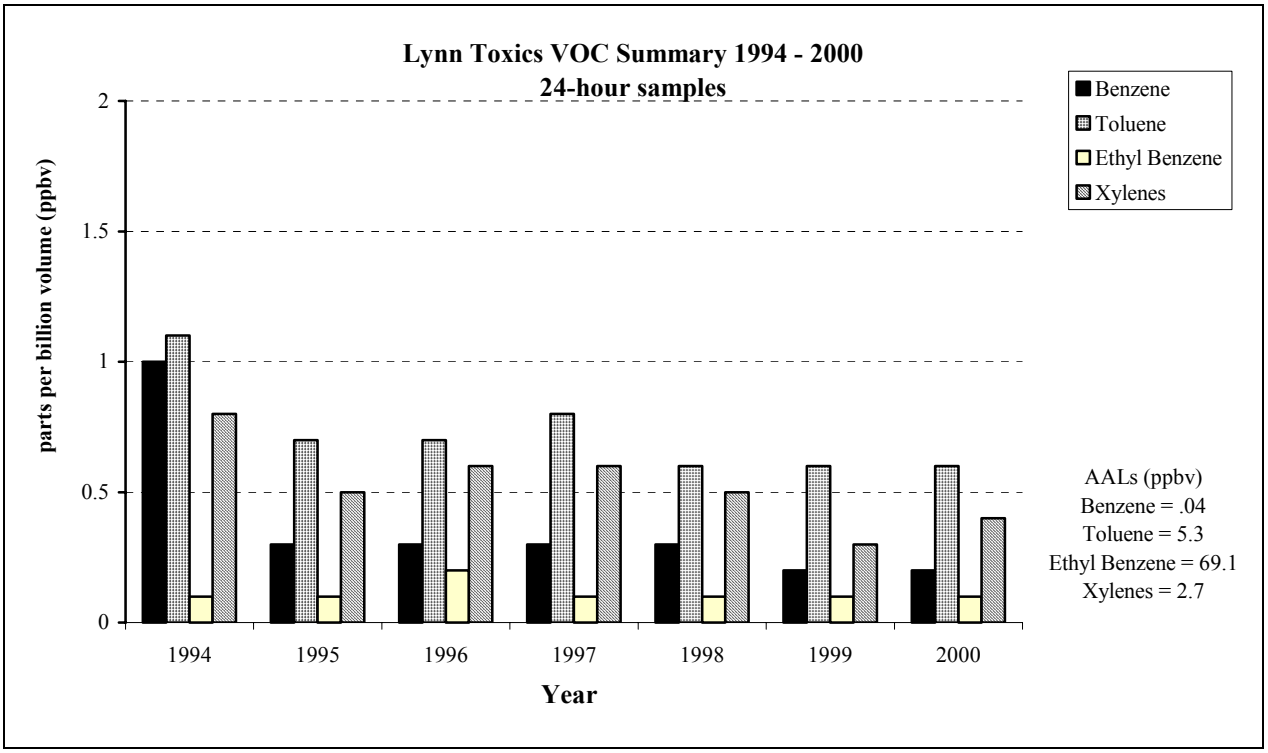


Figure 29

3. Program to Protect Air Resources

What are DEP's programs to protect air resources?

DEP is committed to the protection of Massachusetts' air quality resources and reducing the public's exposure to air pollution from sources located within and outside the Commonwealth. DEP concentrates on controlling ambient emissions of air pollutants (including emissions of toxic compounds) from stationary sources (e.g., industrial) and mobile sources (e.g., automobiles) that contribute to violations of federal ambient air quality standards. These standards are set to protect public health.

Working under the mandates of the federal Clean Air Act, DEP develops and uses environmental monitoring, air modeling, emissions inventories, source databases, planning and education tools, tracking mechanisms, permitting, compliance and enforcement to ensure environmental protection.

The regulatory framework for air quality is found at 310 CMR 6.00 through 8.00 and 310 CMR 60.00. Key measures include:

- Controls to cut emissions from large utility and factory boilers
- Cleaner products, such as reformulated household cleaners, paints, stains, and other consumer products
- Controls to reduce emissions from auto body painting operations and landfills
- Cleaner vehicles through new car standards
- Cleaner fuels
- Vehicle testing and maintenance, and
- Reducing the growth in miles driven and vehicle trips.

4. Challenges for 2002 – 2003

What are the air quality challenges for the next two years?

The challenges for 2002-2003 include:

- In late summer of 1998, due in part to community concerns, DEP began an extensive effort to examine options to address cumulative exposures. This includes defining what cumulative exposure might mean across DEP. To date, DEP cumulative exposure assessments have only addressed the aggregate impacts of air emissions. Citizens groups have requested that we begin to consider multimedia impacts (e.g., from air, water, and soil). DEP has established a multi-bureau workgroup that is discussing the state of the science, data availability, and options and opportunities to move the issue and science forward. Pursuant to Interim Guidance for Solid Waste Facility Siting issued in 2001, DEP will be analyzing cumulative air exposure in the vicinity of solid waste facilities that seek a permit for siting or operation.

- Since October 1999, DEP has been testing gasoline powered light and heavy duty motor vehicles for excess emissions using a transient test similar to IM240. The program enjoys widespread acceptance by the public, inspection stations and repair facilities. In February 2001, DEP expanded the Enhanced Emissions and Safety Test to include the testing of heavy duty diesel vehicles for excess emissions. In the coming years DEP will concentrate on implementing onboard diagnostic testing (OBD) testing and ensuring that the highest emitting vehicles continue to be accurately identified and repaired.

- DEP also will expand its efforts to reduce diesel pollution by developing a comprehensive diesel pollution prevention strategy. Primarily focusing on mobile sources, this strategy will allow DEP to better concentrate its existing and future diesel pollution prevention efforts within the agency and better coordinate those efforts with other stakeholders and interests, including EPA.

- EPA and states, including Massachusetts, are faced with the question of when and how they will implement the more protective 8-hour ozone standard, which is still being litigated in the federal courts. Questions remain as to how federal requirements and policies under the one-hour ozone standard mesh with those under the eight-hour standard, and to what extent Massachusetts may need to adopt control measures to achieve additional reductions to attain and maintain the one-hour ozone standard.

What are the air quality challenges for the next two years? (continued)

- DEP must begin assessing what controls may be needed to attain and maintain particulate and visibility standards. DEP is part of a regional planning process to determine how states will achieve visibility standards set for the national parks. This will likely require additional controls to reduce particulate emissions, primarily sulfur and nitrogen oxides, over a wide area, including Massachusetts.

- DEP passed first in the nation emission limits on CO_2 emissions from power plants. These limits were part of four pollutant regulations (SO_2, NO_x, Hg and CO_2) for six of the highest emitting facilities in the Commonwealth. The limits will begin to address the problem of global climate change from the state's perspective. As part of this effort, DEP expects to expand our emission trading program to include CO_2 trading and will be examining appropriate mechanisms that effort.

- DEP will also be assessing its air toxics programs over the next two years. The first phase, developing more comprehensive inventories is underway and data has been submitted to EPA as part of the National Air Toxics Assessment (NATA) program.

Prevent and Manage Waste

Prevent and Manage Waste Goals #2 and #3: Pollution Prevention and Safe Waste Management

A. Self Assessment

1. Strategies to reduce and manage hazardous and solid waste

What are DEP's strategies for reducing and managing hazardous and solid waste?

DEP works to protect human health and the environment from the effects of solid and hazardous waste by preventing pollution and the generation of wastes to the maximum extent possible, promoting reuse and recycling of wastes that are generated, and ensuring sound disposal of wastes as a last resort. DEP's programs are diverse and far-ranging, bringing pollution prevention and safe waste management practices to business operations (using a facility-wide, multimedia approach), the design of certain consumer products (e.g., less toxic paints and cleaners), and to the behavior of the general public (e.g., encouraging recycling and environmentally sound purchasing).

How are these strategies implemented?

DEP carries out its pollution prevention and safe waste management strategies by:

- establishing regulatory standards
- issuing permits
- educating industry and the public
- providing compliance assistance
- verifying business self-certifications and reports, and auditing their environmental performance
- inspecting facilities, and
- initiating enforcement actions when violations are found.

What strategies will be emphasized in 2001-2002?

Key strategies to further pollution prevention include:

- implementing the Environmental Results Program (a self-certification program)
- developing strategies for reducing persistent, bioaccumulative toxic chemicals (PBTs) as part of the Toxics Use Reduction Program
- developing the Environmental Stewardship Program to encourage facilities to implement environmental management systems to help sustain and exceed compliance
- implementing the New England Governors and Eastern Canadian Premiers *Mercury Action Plan* and the Massachusetts *Zero Mercury Strategy*
- issuing permits that incorporate pollution prevention, and
- seeking pollution prevention in compliance and enforcement actions.

Key strategies to further safe waste management include:

- implementing the *Beyond 2000 Solid Waste Master Plan*
- ramping up municipal and commercial source reduction and recycling programs
- expanding the Household Hazardous Products (HHP) Program
- implementing risk evaluations for new or expended solid waste facilities
- revising the solid waste permitting regulations to incorporate enhanced landfill liner design requirements, improved beneficial use determination process, and increased recycling commitments from solid waste facilities
- ensuring proper waste management through permitting, and
- ensuring proper waste management through compliance and enforcement, including increased enforcement of solid waste bans.

2. Solid Waste

How much trash does Massachusetts generate?

Figure 31 below shows the annual amount of solid waste generated in Massachusetts from 1995 through 1998, and how it was managed. Solid wastes included in DEP's Solid Waste Master Plan are municipal solid waste (typical trash from households and businesses) and non-municipal solid waste (primarily construction and demolition debris). In 1999, 50% of all waste generated was diverted from disposal to recycling. Note: Methodology and data have been updated recently, so Figure 30 below is different from Figure 30 in the Draft PPA.

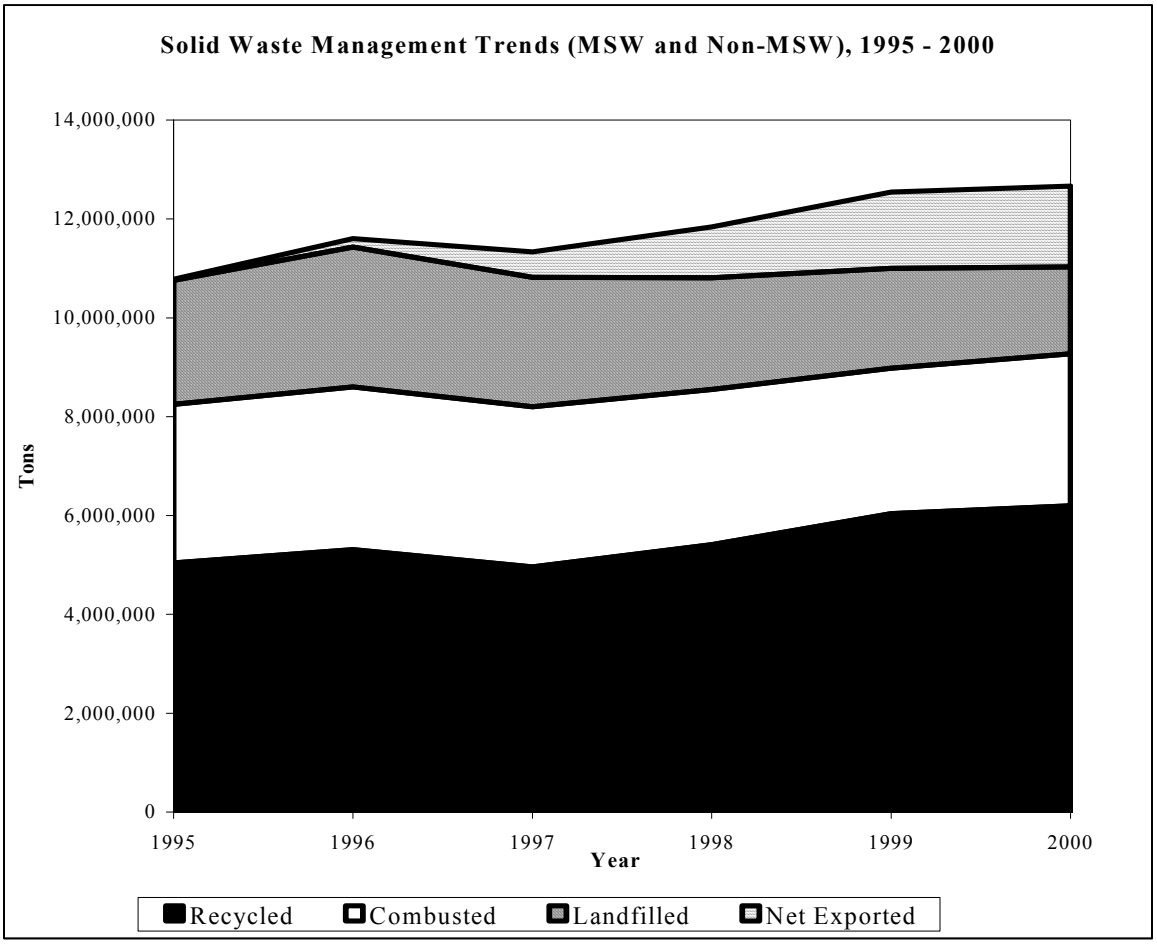


Figure 30

How much trash does Massachusetts generate? (continued)

Table 10 shows a breakdown of 1998 and 1999 Massachusetts solid waste into municipal (MSW) and non-municipal (non-MSW) categories. Data has been revised since 1998 due to additional data and improved methodology. Some totals do not add due to rounding.

Table 10: Solid Waste Management in 1998, 1999, and 2000 (millions of tons)

	1998	1999	2000
Generated Solid Waste	11.80	12.54	12.64
• *Municipal*	*7.38*	*7.59*	*7.99*
• *Non-Municipal*	*4.43*	*4.95*	*4.66*
Recycled Solid Waste	5.41	6.04	6.20
• *Municipal*	*2.29*	*2.52*	*2.70*
• *Non-Municipal*	*3.12*	*3.52*	*3.50*
Instate Disposed Solid Waste	5.40	4.96	4.83
• *Municipal*	*4.19*	*3.90*	*4.08*
• *Non-Municipal*	*1.21*	*1.06*	*.75*
Net Exported Waste	1.03	1.55	1.61
• *Municipal*	*0.89*	*1.18*	*1.20*
• *Non-Municipal*	*0.14*	*0.37*	*.42*

What does DEP do to regulate solid waste?

DEP regulates the siting, design, operation, and closure of solid waste facilities — including landfills, incinerators, trash transfer stations, and certain recycling and composting facilities — to ensure that these facilities do not pose risks to public health and the environment. DEP establishes performance standards that these facilities must meet, issues permits, conducts inspections, and takes enforcement actions where necessary. DEP has been working with municipalities across Massachusetts for several years to close unlined landfills. In 1993, 105 active unlined municipal landfills were targeted for closure; DEP has now closed all but two active unlined MSW landfills (see Figure 31 below).

Number of Unlined Landfills in Use, 1992 - 2002

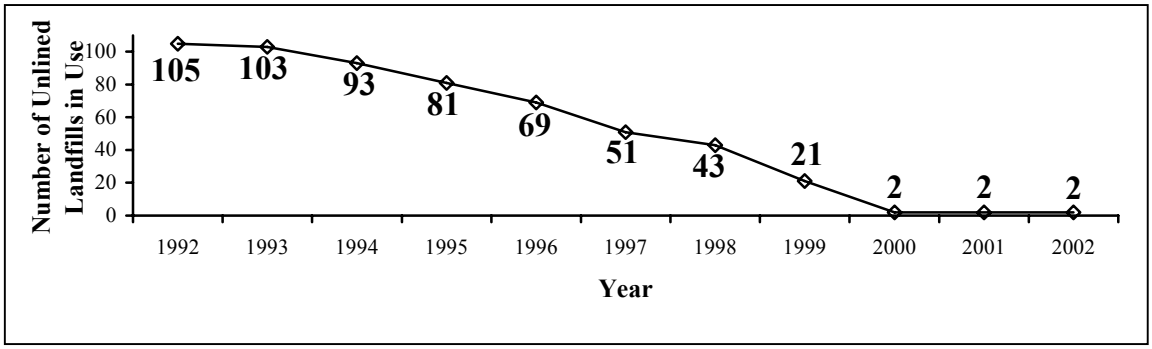


Figure 31

What does DEP do to reduce the amount of waste disposed in landfills and incinerators?

DEP promotes source reduction (producing less waste), toxicity reduction (keeping toxic materials out of landfills and incinerators), and recycling through a variety of programs, most of which are directed at helping municipalities implement local recycling and household hazardous products collection programs. In 2001, DEP expects to receive $14 million from the Clean Environment Fund which will be used to assist municipal recycling programs through recycling equipment grants, incentive payments, and community outreach grants. DEP's strategy for 2001 includes increasing access for citizens that currently have no recycling services, encouraging greater industry participation in commercial recycling, increasing source reduction activities (i.e., on-site composting), reducing the toxicity of waste streams, and improving markets for recoverable materials. DEP is working to make existing waste bans (which prohibit disposing of recyclable materials) a more effective tool for diverting materials from landfills and incinerators. DEP recently hired four additional inspectors to enforce waste ban compliance plans at landfills, incinerators, and transfer stations.

What are Massachusetts' recycling and solid waste milestones?

In 2000, DEP published the *Beyond 2000 Solid Waste Master Plan*, laying out a ten-year strategy for managing the Commonwealth's solid waste. This Plan reaffirmed the Commonwealth's integrated waste management hierarchy favoring source reduction, followed by recycling, and disposal as a last resort. It also set the following milestones for 2010:

- Achieve 70% waste reduction (which includes both source reduction and recycling), including:
  - 60% municipal solid waste (MSW) waste reduction, and
  - 88% construction and demolition (C&D) waste reduction
- Substantially reduce the use and toxicity of hazardous products and provide convenient hazardous product collection services to all residents and very small quantity hazardous waste generators.

Where is Massachusetts relative to these milestones?

Since 1990, Massachusetts has made great strides in diverting waste from disposal. The recycling rate for municipal solid waste has risen from 10% in 1990 to 38% in 1999. The total MSW waste reduction rate (which includes source reduction and recycling) was 39% in 1999.

Access to comprehensive recycling services for Massachusetts residents has increased from 10% in 1990 to 85% in 1999. In addition, DEP has continued to promote efforts to reduce the toxicity of the waste stream by recycling or otherwise properly managing hazardous household products. To date, over 100 household hazardous products collection programs have been established to collect and recycle or dispose of paint, used oil, mercury-containing products (such as batteries, thermostats, and fluorescent lamps), and other products; these programs currently serve nearly 50% of the population.

What are Massachusetts' solid waste plans for the future?

DEP's strategies for the future are described in the *Beyond 2000 Solid Waste Master Plan*. The overarching goal of the *Master Plan* is environmentally sound waste management through a reduction in the amount and toxicity of waste generated, an increasing rate of recycling, and the provision of environmentally safe disposal capacity.

How is mercury addressed in DEP's solid waste plans?

DEP has developed a comprehensive mercury reduction strategy. Addressing air emissions through pollution control equipment is short-term portion of strategy. At the strategy's core, however, is pollution prevention. This includes diverting mercury out of the waste stream through means such as recycling and source substitution. Massachusetts is also a signatory to the New England Governors and Eastern Canadian Premiers *Mercury Action Plan*, and intends to meets the goals of that plan.

For further discussion of the air-related portion of the strategy, please refer to Part 2e in the Bureau of Waste Prevention's Goal #1, National Air Strategy.

3. Toxics Use Reduction

What is the Toxics Use Reduction Program?

The Toxics Use Reduction Act (TURA) was passed by the Massachusetts Legislature in 1989. It promotes environmental protection by working with industry and focusing on pollution prevention as a way to comply with, and exceed, regulatory standards while increasing the economic competitiveness of Massachusetts industry. The goals of TURA are to:

- reduce toxic waste generated by 50% by 1997
- establish toxics use reduction as the preferred means for achieving compliance with any federal or state law or regulation
- sustain, safeguard and promote the competitive advantage of Massachusetts businesses, large and small, while advancing innovation in toxics use reduction and management
- promote reductions in the production and use of toxic and hazardous substances in the Commonwealth
- enhance and strengthen the enforcement of existing environmental laws and regulations, and
- promote coordination and cooperation between all Massachusetts agencies that administer toxics-related programs.

The Act gave DEP the responsibility for working with industry to meet these goals, along with its TURA partners, the Office of Technical Assistance in the Executive Office of Environmental Affairs and the Toxics Use Reduction Institute at the University of Massachusetts of Lowell. DEP's responsibilities include administering the required TUR planning and reporting by industry, multimedia compliance and enforcement, managing TUR program data, and certifying TUR planners.

In October 1999, DEP and its partner TURA agencies received an *Innovation in American Government Award* for the Toxics Use Reduction Program from the Ford Foundation and the Kennedy School of Government, in partnership with the Council for Excellence in Government. This award is considered to be among the nation's most prestigious public service honors, and recognizes government initiatives that provide creative solutions to pressing social and economic problems.

How are the TURA Goals being met?

As a result of the Toxics Use Reduction Program, participating Massachusetts' manufacturers have reduced their use of toxics by 41%, and their toxic byproduct by 57%, between 1990 and 1999. Massachusetts' manufacturers have also reduced their on-site releases of chemicals by 87% since 1990. See Figure 32 below.

The principles of pollution prevention, the underpinning of TURA, have been applied to DEP's permitting, compliance and enforcement, and regulatory activities, particularly in the Bureau of Waste Prevention. The impact of the application of these principles has been reductions in releases and discharges into the environment. This has been accomplished through source reduction techniques and new approaches to environmental protection such as the Environmental Results Program.

To read about air toxics and mercury, please refer back to Goal #1 (National Air Strategy, part e).

Massachusetts Toxics Use Trends, 1990 to 1999, adjusted for changes in reporting universe

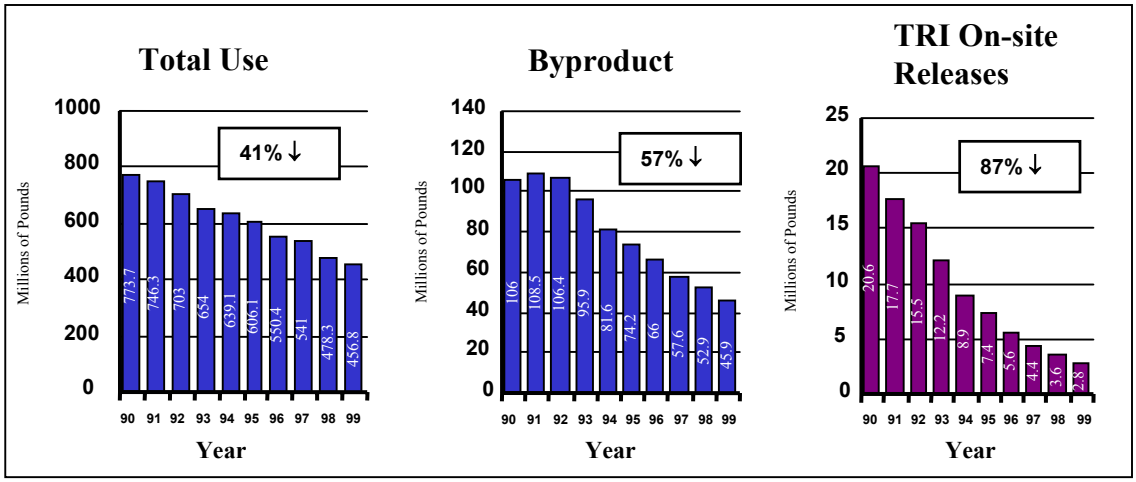


Figure 32

What are the challenges for the Toxics Use Reduction Program?

Challenges for the Toxics Use Reduction Program over the next few years include:

- **Promote Environmental Stewardship.** With the assistance of DEP, the Office of Technical Assistance and TURI, EOEA is developing an Environmental Stewardship Program that will reward companies for superior environmental performance.

- **Continue to incorporate pollution prevention principles into all DEP programs.** DEP is continuing to promote integration into all of the agency's activities.

- **Reduce PBTs.** DEP has adopted lower thresholds for reporting persistent, bioaccumultive toxic chemicals (PBTs) under the TURA program. A major concern of industry is how to develop toxics use reduction plans for reducing what may be very small quantities of PBTs. DEP will work with its partner agencies and program stakeholders to devise a strategy for addressing PBTs.

- **Better educate the public about economic advantages of pollution prevention.** DEP will continue to publish its annual TURA Information Release in a reader-friendly format, explaining the relevance of chemical use and chemical waste to the general public. DEP hopes to develop public awareness of the risks involved in transporting, using, and disposing chemicals.

4. Hazardous Waste Program

What are the mandates and goals of the Hazardous Waste Program?

The federal Resource Conservation and Recovery Act of 1975 (RCRA) establishes nationwide hazardous waste requirements. In 1985, EPA delegated the base hazardous waste program to Massachusetts, which implements the program under the authority of M.G.L. Chapter 21C.

The primary mandates of RCRA include the definition and listing of hazardous wastes and requirements for generators, transporters and facilities. To meet those requirements, DEP maintains a:

- Program to permit hazardous waste treatment, storage and disposal facilities
- Program to license hazardous waste transporters
- Policy and regulation program, and
- Compliance and enforcement program aimed at hazardous waste generators as well as hazardous waste treatment, storage, or disposal facilities.

DEP's management of hazardous waste is more stringent than RCRA in three main areas: the Transporter Program, the Hazardous Waste Recycling Program and the management of waste oil, which is the largest hazardous waste by volume in the Commonwealth.

How is DEP meeting the mandates and goals of the RCRA and Hazardous Waste Program?

DEP currently licenses 16 hazardous waste treatment, storage, or disposal facilities (TSDFs). All 16 facilities are dedicated to storage activities. A few conduct treatment, while none dispose of hazardous waste on-site. Some TSDFs recycle hazardous waste.

DEP licenses approximately 135 hazardous waste transporters (for five years at a time), of which 93 are from out-of-state. Field audits indicate general compliance with requirements; the most common violations relate to manifest completeness.

The Recycling Program presently manages 1,500 permits for recycling hazardous waste. These permits include regulated recyclable materials, waste oil, precious metals, and other hazardous wastes.

What are some of the Hazardous Waste Program's successes?

Since RCRA was developed to prevent the creation of new hazardous waste sites by requiring safe waste management practices, the prime measure of success is the number of sites that have been created since the program's implementation. Using this measure, DEP has been very successful; the creation of new sites through the mismanagement of hazardous wastes (e.g. "barrel sites" or abandoned hazardous waste disposal facilities) has been virtually eliminated.

Hazardous waste compliance and enforcement activities aimed at generators and TSDFs are conducted using a whole facility approach. The types of violations typically found at facilities generally relate to administrative requirements, including marking and labeling. These violations rarely result in a significant threat to public health or the environment. This indicates that hazardous wastes are being safely managed. In addition, interstate shipments of hazardous waste that are headed for ultimate disposal have not been problematic as they often were in the past.

The number of hazardous waste Large Quantity Generators (LQGs), defined as a generator of over 1,000 kilograms (or 265 gallons) per month of hazardous waste has significantly declined over the past decade. In 1986, DEP regulated 1,100 LQGs. As of August 2001 that number has dropped to 496. This trend indicates that industry has been successful in reducing wastes by using pollution prevention strategies.

DEP has developed innovative programs for "hard-to-manage" manufactured consumer items which are technically classified as hazardous waste under federal law. A significant example is the program to manage mercury-containing fluorescent lamps and batteries. The infrastructure associated with managing these wastes and the DEP investment in public outreach have resulted in a significant increase in the recycling and safe management of these waste streams, and have put DEP in a national leadership position in this area of waste management.

What are the challenges for the Hazardous Waste Program in 2002 and 2003?

Regulation and policy development activities for 2002 and 2003 will focus on streamlining regulations and permits, and integrating pollution prevention and source reduction practices into all activities. The following will be included:

- Regulatory amendments to streamline the Class A hazardous waste recycling program
- Amendments that clarify a generator's ability to treat on-site, in tanks and containers and the use of zero discharge hazardous wastewater treatment units, and
- Administrative process amendments to streamline the hazardous waste facility licensing process.

DEP will also continue its efforts to update and obtain federal authorization for state regulations (310 CMR 30.000). DEP submitted to EPA draft authorization regulations (checklists C1-C3 and non HSWA I-IV and HWSA I-III) in March 2001. DEP and EPA have identified outstanding issues and DEP is preparing documentation to support a request for full or partial authorization. These documents will be completed in November 2001.

DEP will continue to dedicate resources to develop policies and programs to manage other "hard-to-manage" manufactured consumer products, building upon the success of the mercury-containing waste product program. This challenge includes the successful continuation of the CRT initiative and then work on other waste streams, such as mercury dental wastes and laboratory dental wastes.

DEP plans to evaluate and propose regulations to clarify use of M.G.L. c. 21C waiver authority.

DEP will evaluate proposed federal changes and potential state changes to existing hazardous waste manifest regulations.

DEP will also evaluate the potential benefits of seeking authorization to implement the RCRA Corrective Action Program employing the Massachusetts Contingency Plan (M.G.L. c. 21E).

5. Environmental Results Program

What is the Environmental Results Program?

The Environmental Results Program (ERP) is designed to enhance and measure performance of whole business sectors. ERP is an innovative program that replaces case by case permits with stringent industry-wide environmental performance standards and an annual certification of compliance. The certification requires the facility to answer specific questions about whether it is meeting applicable environmental performance standards. If it is out of compliance, the facility must submit a compliance plan detailing how and when it will achieve compliance. The certification must be signed, under pains and penalties of perjury, by a high-ranking corporate official, raising the level of corporate accountability for environmental compliance. DEP provides compliance workbooks and other types of outreach to facilities before certification; pollution prevention opportunities are highlighted for each sector.

ERP currently applies to three small business sectors: dry cleaning (650 facilities), photoprocessing (550 facilities), and printing (1,100 facilities). Two additional sector rollouts are underway: firms discharging industrial to sewers wastewater, and firms installing new boilers.

How were principles and performance standards developed?

DEP worked with industry representatives, environmental advocates, and other government agencies to establish the broad principles behind ERP. In addition, DEP works specifically with affected industry groups to establish the performance standards applicable to that industry.

How will ERP be evaluated?

Performance is measured by "environmental business practice indicators" based on data gathered during randomly chosen facility inspections performed before and after certification. With the use of statistics, inspection data is then scored and used to track changes in specific business practices as well as to measure performance over time. The ultimate goal is to use the results of this analysis to create a sustainable regulatory system that directs limited resources to areas of greatest need.

What are the program's successes?

A major success has been identifying and getting small business sectors into the regulatory system and in compliance with environmental standards. For example, before the ERP for dry cleaners, only 10% of the affected facilities were identified in the DEP regulatory system. At the end of the first round of certification, 87% were in the system and participating, and by the end of the second round, the percentage rose to 95%. Comparable results were achieved by the photoprocessors and by the printers.

Both qualitative and qualitative results reveal higher environmental performance after the first certification. Both dry cleaners and photoprocessors has a statistically significant increase in environmental performance as a result of ERP. In the first year of ERP, 10% of facilities self-disclosed violations and committed to return to compliance. Printers were found to have reduced VOC emissions, ceased disposal of hazardous waste with solid waste, and eliminated practices such as washing ink-contaminated press rollers in sinks. Dry cleaners were found to have made significant compliance and pollution prevention changes to their operations as a result of ERP. Changes included: instituting leak detection and repair programs; changing filters more regularly; vacuuming coils on a schedule; scheduling full loads whenever possible; and eliminating illegal wastewater discharges. Finally, photoprocessors found that ERP prompted reductions in silver discharges to POTWs through installation of silver recovery units and frequent planned cartridge changes.

What are the program's challenges?

In order to grow the Environmental Results Program and expand it to new sectors, an automated system is necessary. Currently, all certification forms are manually entered and reviewed. DEP is working towards the goal of creating a system that would be entirely automated, i.e. certifications would be entered into a system electronically through telephone, fax, or scanning equipment, and with the use of business rules or intelligence, the system would be able to review all facility certifications, identify inconsistent data or "red flags," score performance of all facilities, and generate, as appropriate, follow-up enforcement documents, such as warning letters and notices of noncompliance.

6. Industrial Wastewater — Redesign of Sewer Connection Program

What are the goals of the Industrial Wastewater Program?

The goal of the Industrial Wastewater (IWW) Program is to reduce environmental harm resulting from industrial wastewater discharges. The Program regulates three types of dischargers: dischargers to the surface water, indirect dischargers (through the sewers to Publicly Owned Treatment Works or POTWs), and dischargers to the groundwater. The sewer connection program implements the Massachusetts Clean Waters Act and associated regulations (314 CMR 2.00, 7.00 and 12.00), which apply to the management of industrial wastewater going to Publicly Owned Treatment Works (POTWs). DEP is currently evaluating and redesigning the entire IWW program, starting first with indirect dischargers and POTWs.

At present, DEP's primary goal is to enhance coordination between and compliance with locally issued industrial sewer discharge permits and DEP-issued industrial wastewater discharge permits.

The following strategies support this goal:

- Incorporate pollution prevention requirements into the sewer connection regulations while continuing to provide pollution prevention technical assistance
- Focus DEP industrial wastewater resources on addressing the most significant industrial wastewater sewer discharges
- Streamline and clarify DEP and EPA roles and responsibilities
- Use local resources to the maximum extent appropriate by delegating authority when suitable, and
- Integrate the industrial sewer connection program into DEP's Watershed Approach to assess environmentally significant dischargers.

What facilities are regulated?

DEP regulates the following industrial facilities:

- Approximately 30,000 industrial and commercial facilities covered by DEP's industrial sewer connection permit program
- Several thousand sanitary sewer connections and extensions (i.e., non-industrial sources such as condominiums), and
- 140 POTWs in Massachusetts (50 with Industrial Pretreatment Programs and 90 with no Pretreatment Programs)

What is the status of the Program Revisions?

The conceptual approach to the redesign of the indirect dischargers has been developed and accepted by an 80-person advisory committee. The approach combines ERP certifications and the water basin planning cycle. It has five components:

- annual ERP certifications by the major dischargers
- evaluation of the remainder in the context of the 5-year basin cycle and individual basin needs
- the creation of a multimedia POTW evaluation methodology
- revision of sanitary connection and extension permits, and
- development of capacity management guidance for sewer collection systems, as part of a coordinated effort by six northeastern states.

DEP is in the process of developing the certification regulations for the major dischargers.

What are the challenges for 2002-2003?

DEP has identified the following as challenges for the next 2 years.

- Draft regulations for Phase I: certifying locally-permitted industrial sewer dischargers
- Develop a comprehensive and effective evaluation and delegation process for POTWs, and
- Evaluate non-certifying dischargers in the context of the 5-year basin cycle.

Clean Up Waste Sites

Clean Up Waste Sites Goal #1: Maximize risk reduction
Clean Up Waste Sites Goal #2: Facilitate the cleanup of brownfields sites
Clean Up Waste Sites Goal #3: Increase the rate of cleanup actions
Clean Up Waste Sites Goal #4: Ensure the quality of cleanup actions
Clean Up Waste Sites Goal #5: Ensure the sound closure of unlined landfills
Clean Up Waste Sites Goal #6: Ensure the sound closure and cleanup of contaminated sites at licensed and interim-status hazardous waste treatment, storage, and disposal facilities

A. Self Assessment

1. Introduction

How does DEP deal with the cleanup of waste sites and the closure of unlined landfills?

The goal of DEP's cleanup efforts is to protect health, safety, public welfare, and the environment from the dangers posed by uncontrolled sources of contamination. Three DEP programs deal with cleanup:

- the Waste Site Cleanup Program (authorized by Massachusetts General Law Chapter 21E) addresses most releases of oil and hazardous materials and is the primary vehicle for achieving the Commonwealth's cleanup goals
- the Solid Waste Management Program (authorized by M.G.L. Chapters 21H and 111, §150A) addresses the assessment and closure of unlined landfills, and
- the Hazardous Waste Management Program (authorized by M.G.L. Chapter 21C) addresses contamination at licensed and interim-status hazardous waste facilities. These cleanups are implemented under facility licenses, closure and post-closure plans, and administrative orders under Chapter 21C and the implementing regulations 310 CMR 30.000.

Regardless of the oversight authority, DEP requires all sites to be cleaned up to an equivalent standard with appropriate opportunities for public involvement.

2. The Waste Site Cleanup Program

What are DEP's responsibilities under the State Superfund Law?

DEP is required by the state Superfund Law (M.G.L. Chapter 21E, enacted in 1983) to ensure timely responses to releases of oil and hazardous materials to the environment. In a typical year, DEP responds to more than 2,000 oil and hazardous material spills, fires, and other environmental emergencies. The agency also deals with (either directly or indirectly) sites where historical contamination from past uses has been discovered. If left uncontrolled, these sites can endanger drinking water, ecosystems, and public safety. Economic development suffers, too, because uncertainties about cleanup costs and liability can leave businesses reluctant to redevelop contaminated properties, especially in our cities. Instead, businesses often choose to build facilities in "green" suburban and rural areas, encouraging sprawl and leaving prime urban property underused or abandoned, and moving jobs out of our cities.

Why and how was the Waste Site Cleanup Program redesigned?

In 1993, DEP redesigned the Waste Site Cleanup Program to encourage faster assessment and cleanup of contaminated sites without compromising environmental standards. Amendments to Chapter 21E enacted in 1992 gave property owners and other potentially responsible parties (PRPs) both more responsibility for cleanups and greater flexibility to get them done. This initiative was designed to allow DEP staff to focus on higher priority sites and associated activities such as site discovery, at the same time allowing the private sector to move forward with cleanup of lower priority sites. The rules for reporting, assessing, and cleaning up releases of oil and hazardous materials were codified in a totally revamped Massachusetts Contingency Plan (MCP), which took effect on October 1, 1993.

Under the new rules, parties conducting response actions hire private environmental professionals licensed by an independent state board to evaluate site conditions and oversee response actions. These Licensed Site Professionals (LSPs) manage site work and provide opinions that it meets state requirements — in most cases without the need for DEP's direct involvement. The agency then audits the results at a portion of all sites each year to ensure adherence to state cleanup standards and conducts other activities to ensure compliance.

Sites not permanently cleaned up within one year of notification to DEP are scored using the MCP's Numerical Ranking System and classified to determine the subsequent level of DEP oversight. Cleanups of sites classified as Tier II may proceed without direct DEP involvement. Tier I site cleanups require a DEP permit and the most complicated of these (Tier IA) are overseen directly by the agency. Permanent solutions that eliminate all significant risks must be achieved at all sites, regardless of classification. Sites where property owners or other parties fail to classify their sites by the one year deadline are classified as "default Tier IB" and risk DEP enforcement actions if they continue to fail to meet their assessment and cleanup obligations.

3. Status

What is the status of the Waste Site Cleanup Program?

Since the new Waste Site Cleanup Program started operation in 1993, there has been a significant increase in the overall amount of cleanup and number of sites reaching closure.

Approximately 17,500 releases exceeding notification thresholds have been reported to DEP since 1993, (data is for the time period October 1, 1993 through June 30, 2001).

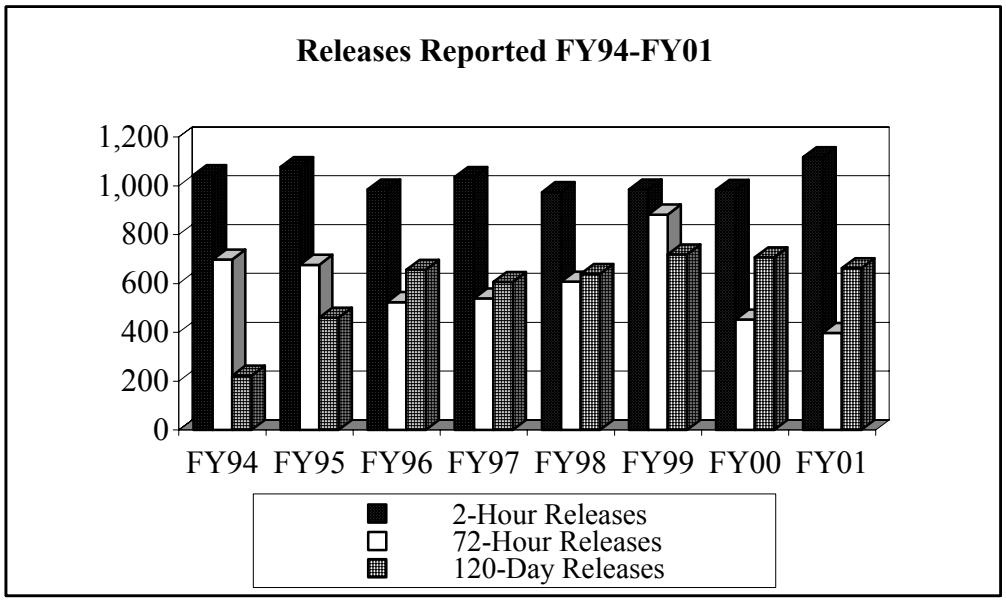


Figure 33

- Time critical releases must be reported within 2 hours or 72 hours, and
- Historical contamination of soil and ground water must be reported to DEP within 120 days.

How many Risk Reduction Measures have been implemented?

Since 1993 more than 17,400 risk reduction measures have been implemented (approximately 12,800 mandatory Immediate Response Actions and 4,600 voluntary Release Abatement Measures).

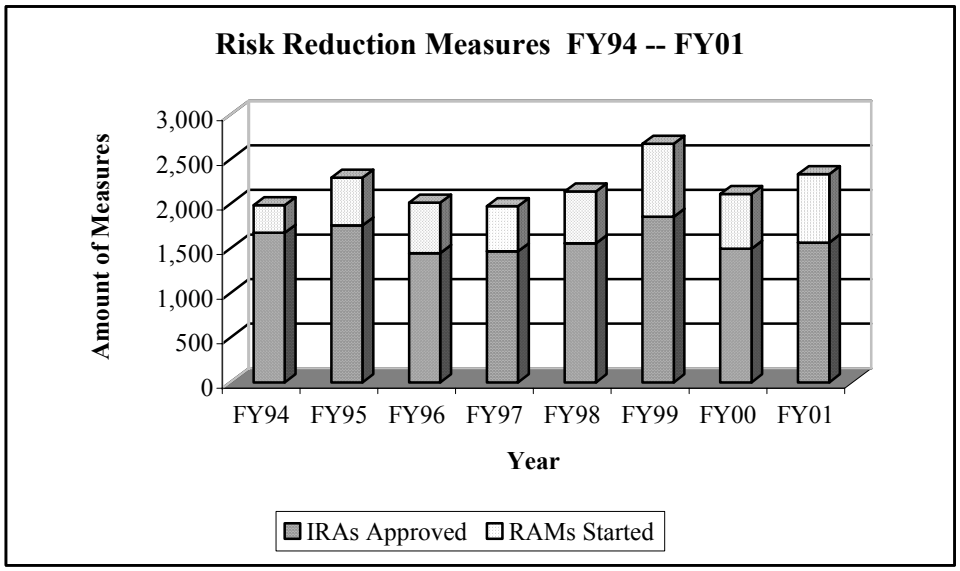


Figure 34

How many sites have been cleaned up?

More than 14,000 assessments and/or cleanups (of sites and spills) have received LSP "sign off" indicating the achievement of no significant risk or no substantial hazard (i.e., a Response Action Outcome or "RAO" was filed) to get out of the MCP system.

- Approximately 97% of RAOs filed show that releases have been cleaned up to a permanent solution with 88% of RAOs cleaned up to levels that are suitable for unrestricted use and 9% of RAOs filed an activity and use limitation (AUL).

- Approximately 3% of RAOs filed show that releases have been cleaned up to a temporary solution.

How many Response Action Outcomes have been submitted?

The numbers of Response Action Outcomes submitted represent a significant increase in the pace of cleanups and site closures compared to the old program. More than fourteen times as many sites were closed out in the first four years of the new program (FY94 – FY97) than in the last four years of the old program (approximately 3,146 sites compared to 225).

A total of 14,496 Response Action Outcomes have been submitted. Approximately 2,500 of these RAOs are for sites that had languished for years under the old rules.

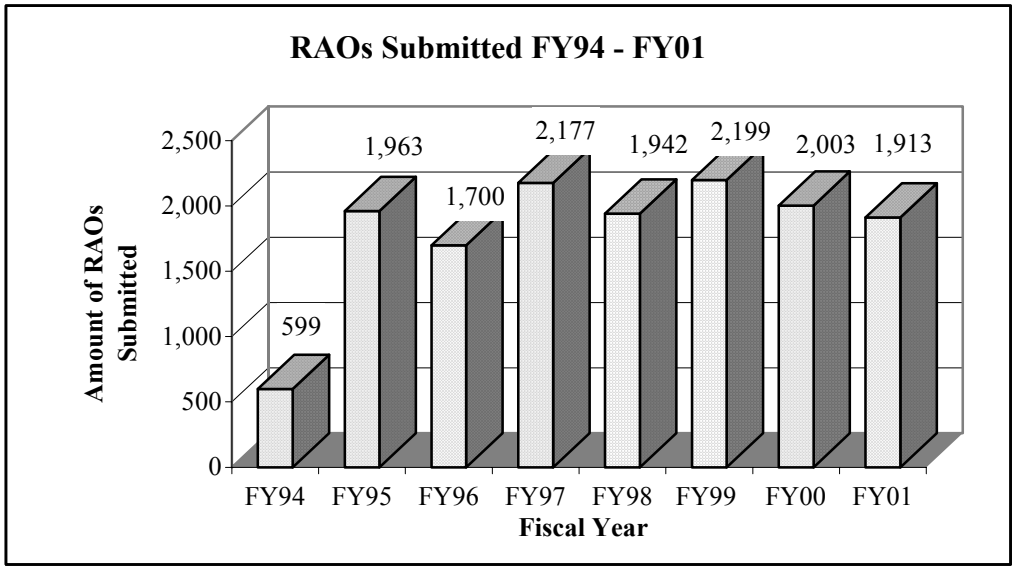


Figure 35

What is the rate of cleanup?

The more seriously contaminated sites experienced an even bigger increase in the rate of cleanup: in the last four years of the old program, only 3 priority sites completed cleanup, while in the first four years of the new program, 68 former priority sites completed cleanup (these former priority sites all started off in the new program as Tier IA sites, but most were subsequently downgraded by DEP because they no longer needed direct oversight).

The increased pace of cleanup has substantially reduced the backlog of sites. When the new program took effect in 1993, there were more than 6,800 sites that required further action (referred to in the new program as "transition sites"). Of these, 3,616 have subsequently been closed out compared to only 564 sites that were closed out in the old program. For the first time, DEP has experienced a downward trend in the size of the total universe of sites.

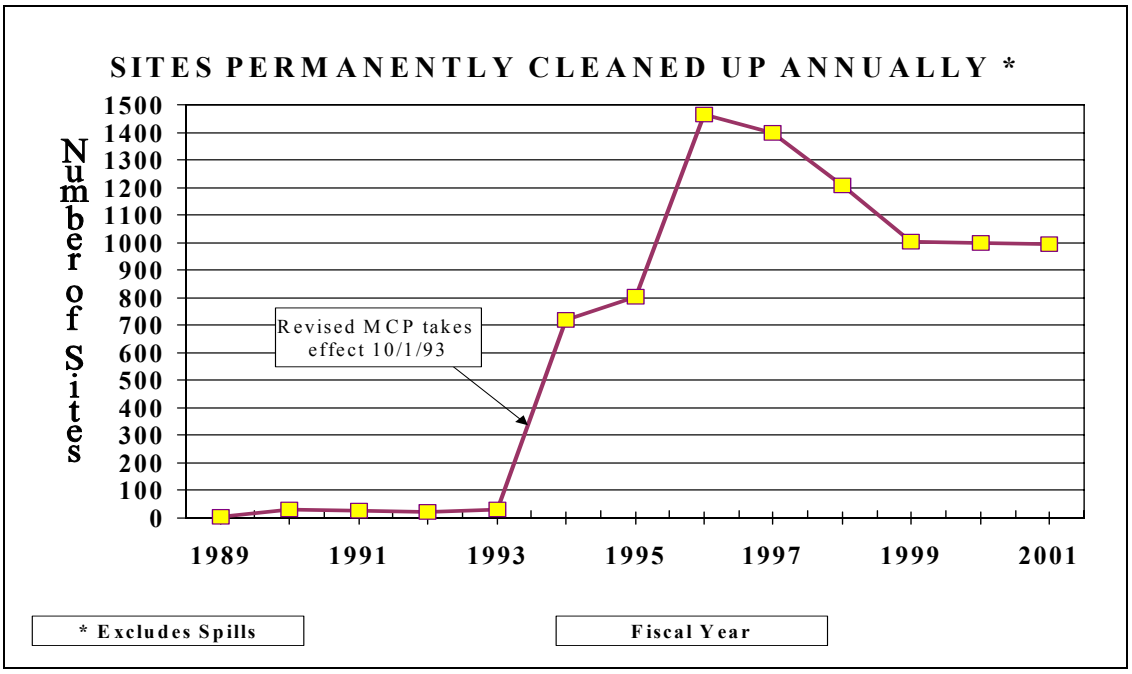


Figure 36

What is the current status of sites?

For new releases reported more than one year ago (i.e., reported in fiscal years 1994 – 2000), 70% have achieved an RAO reflecting the efficient cleanup of releases.

The remaining releases were Tier Classified, and have five years to achieve a permanent solution.

- Sites classified as Tier IA pose the greatest risk, are the most complex and required direct DEP oversight.
- Sites classified as Tier IB, Tier IC and Tier II pose less risk, are less complex and do not require direct DEP oversight.

What is the status of open sites?

The universe of sites in need of further action totals 6,428, and includes:

- 1,324 "pre-classified" sites that have not yet reached the one-year deadline for Tier Classification (and must either clean up or Tier Classify by this deadline).

- 3,601 Tier Classified sites[5] that have five years from the date of Tier Classification to complete a cleanup or implement a long-term remedy.

- 1,503 "default Tier IB" sites that have missed the deadline for Tier Classification and are in noncompliance. These default sites are subject to DEP enforcement.

[5] 75 of the 266 Tier IA sites are included on the federal Superfund National Priorities List (NPL); The U.S. Environmental Protection Agency (EPA) lists the number of NPL sites in Massachusetts as 31. DEP's number is higher because the Massachusetts Military Reservation site is listed as 47 Tier IA sites in DEP's list.

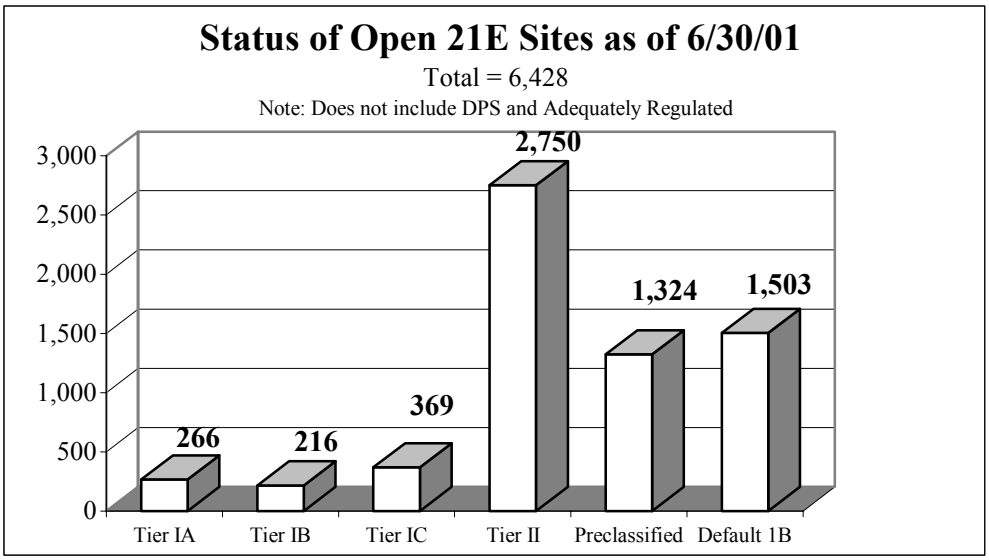


Figure 37

What are the successes of DEP's redesigned Waste Site Cleanup Program?

The following are the conclusions of the *Final Generic Environmental Impact Report,* a broad evaluation of the redesigned program, published in February 1999:

- The privatized program, which relies on the expertise and resources of the private sector, has successfully allowed people who want to proceed with cleanup to do so, with minimum involvement by DEP. Essentially, the redesigned program has clearly accomplished one of its primary goals, which was to remove government-related obstacles for people who want to proceed with assessments and cleanups.

- The program's reporting thresholds and incentives for early action (including reducing risks) have ensured that many small contamination problems are dealt with completely and quickly once they are reported to DEP. Very small problems that are not likely to pose significant risk for health, safety, public welfare or the environment (and therefore do not need state attention) are not entering the program.

- These changes have allowed DEP to focus its resources on the areas that require government attention: developing standards for making assessment and cleanup decisions, oversight of oil and hazardous materials emergencies and sites presenting high levels of risk for public health and the environment, and auditing private sector work to make sure that it complies with DEP's requirements.

Where will DEP focus its efforts?

DEP will focus it efforts in the following program areas:

- To improve the quality of private sector work, DEP plans to better define performance standards in the Massachusetts Contingency Plan (MCP); continue strong enforcement (by DEP and the LSP Board); continue implementing improvements to the audit program; and continue training and education efforts.

- DEP enforcement will continue to dedicate significant resources to address the issue of non-responders, those sites where parties responsible for remediating releases of oil or hazardous materials have failed to make required submittals to DEP documenting the progress of response actions performed.

- DEP will continue to improve the integration of the federal Superfund program to provide additional incentives to parties to voluntarily conduct remedial activities in compliance with the MCP.

- DEP will continue to update its standards, regulations, and policies governing decision-making about how to investigate and clean up sites, making sure that they are based on the latest scientific and technical advances.

- DEP will also continue to develop proposals to implement improvements to surgically strengthen key MCP performance standards and streamline/clarify existing rules, including changes to our regulations and some of our operating procedures.

- To improve its ability to evaluate and communicate the activities and success of the Waste Site Cleanup program, to both internal and external audiences, DEP will focus on developing indicators of program performance and measures of success.

4. Activities in 2002-2003

How will DEP facilitate the cleanup of Brownfields sites?

The Commonwealth of Massachusetts is a nationally recognized leader in addressing the many challenges that hinder brownfields cleanup and redevelopment. Innovative programs developed by the state over the past decade have significantly increased the number of contaminated sites being cleaned up and successfully redeveloped.

DEP has contributed in two important ways to brownfields revitalization efforts in the Commonwealth of Massachusetts. First, site assessment and cleanup regulations have been privatized to eliminate the need for DEP involvement in most transactions. The privatization of the Massachusetts Waste Site Cleanup Program in 1993 enabled more cleanups to be undertaken without direct DEP oversight. In its first four years, the program saw a fourteen-fold increase in the number of sites permanently remediated.

Second, DEP has taken a proactive role in providing technical assistance to project proponents to facilitate the cleanup and redevelopment of brownfield sites. Incentives established through the 1998 Brownfields Act have increased the number of sites cleaned up by helping interested parties address unknown risks that might hinder brownfields transactions, and by providing financial resources and liability protection. DEP has successfully "teamed" with other state brownfields partners to identify and address obstacles to cleanup and redevelopment, promoting environmental protection and economic development goals.

Because environmental assessment and cleanup are the critical first steps in the brownfields redevelopment process, DEP must continue to be proactive in identifying potential brownfield sites and helping them move through the system to a regulatory endpoint. DEP has streamlined agency response to brownfields inquiries and issues by increasing staff dedicated to brownfields and providing single points-of-contact in both Boston and our regional offices across the Commonwealth. The agency must continue to provide technical project assistance to businesses, developers, lenders, and community groups in all phases of brownfields projects.

Some highlights of DEP's brownfield efforts:

- Over the past three years, DEP has provided targeted project assistance to more than 208 projects in over 80 communities across the state.
- DEP is performing site assessment activities at three brownfields sites totaling $190,000 through a grant from the EPA Brownfields Site Assessment Program.
- DEP is also assisting communities by providing on-scene coordinator functions required by EPA through the EPA Revolving Loan Fund Program, enabling future assessment and cleanup at 24 sites in 7 communities.

DEP has come a long way toward increasing awareness of brownfields issues and incentives through strong interagency partnerships with state brownfields partners at MassDevelopment, MassBusiness, the Department of Revenue and the Attorney General's Office.

How will DEP facilitate the cleanup of Brownfields sites? (continued)

DEP has also worked towards developing new ways to increase flexibility in our own regulations and procedures to help address ever evolving brownfields challenges, including:

- Developing a special project designation that provides increased flexibility on cleanup deadlines for certain types of projects; and
- Working cooperatively with parties interested in revitalizing DEP priority lien sites and with the communities in which they are located to recover past cleanup costs while ensuring cleanup and local land-use goals are met.
- Developing proposals to streamline approvals and assessment procedures for construction related activities under the MCP.

Early DEP involvement and issue identification have helped promote environmental protection goals early in the process, and DEP should continue to play a strong and continued role to facilitate brownfields projects over the next decade. A continued focus will be placed on educating businesses, developers, lenders, and community groups about Chapter 21E.

How does DEP work in partnership with EPA to clean up sites?

EPA provides resources to DEP for a number of cleanup activities. Through the federal Superfund Program, EPA supports state oversight of cleanup work at federal Superfund sites within Massachusetts (i.e. sites listed on the National Priorities List). These funds pay for state oversight and also help defray state management expenses. As a result of a long-standing cooperative process, both EPA and DEP prioritize Superfund activities to be undertaken each fiscal year and share in subsequent management responsibilities.

DEP will continue working with EPA to integrate state and federal assessment and cleanup programs to achieve maximum flexibility and state priority setting. We will focus federally supported resources on supporting the privatized cleanup program through two EPA grants:

- Multi-Site Cooperative Agreement (MSCA) grant will continue to provide resources for reviewing and auditing sites on CERCLIS to ensure that response actions meet state standards and to assist EPA in making decisions to de-list sites from CERCLIS.

- Voluntary Cleanup Program (VCP) grant will provide resources for developing and implementing program improvements identified in the evaluation of the 21E Program.

DEP also receives EPA funding to help defray those portions of the 21E Program related to the assessment and removal of leaking underground storage tanks. In addition, EPA and DEP are using other mechanisms to encourage private response actions, including developing a "Commissioner/Regional Administrator Watch List," evaluating out-of-compliance sites for listing on CERCLIS, and referring sites for inclusion on the NPL.

Clean Up Waste Sites Goal #5: Ensure the sound closure of unlined landfills
Self Assessment
Solid Waste Landfills

Why is it important to properly close unlined solid waste landfills?

Proper closure of unlined solid waste landfills greatly reduces the generation of leachate which in turn contaminates groundwater.

Leachate is created when precipitation falling on a landfill surface percolates through the waste and carries decomposed and semi-decomposed waste downward toward the base of the landfill.

Leachate at unlined landfills migrates below the waste and outside the landfill footprint toward groundwater, surface waters, and other resources which are then contaminated by the addition of the leachate constituents.

Proper closure of unlined landfills involves:

- capping the top of the landfill with a properly engineered cover to prevent precipitation from contacting the waste and therefore significantly reducing leachate
- corrective action to eliminate further migration of existing leachate, and
- continued water monitoring at and near the closed landfill to warn about potential adverse impacts to people and ecological resources near the landfill.

Proper closure of a landfill also significantly reduces the diffusion of dangerous landfill gases into the atmosphere. At some landfills, this has involved collection of gases in pipes below the cap and directing the gases to be burned in flares or used as an energy source.

What are DEP's plans to close unlined solid waste landfills in Massachusetts?

DEP has closed all but two unlined solid waste landfills in Massachusetts. At these two sites there are plans to discontinue waste disposal at the unlined areas and to start disposal in lined cells nearby. DEP also is developing a longer term strategy to assess and take appropriate action at the inactive unlined landfills.

How many unlined solid waste landfills have been closed over time?

Since 1994, when the Hynes Amendment directed DEP to categorize active landfills, DEP has negotiated Administrative Consent Orders with landfill operators/owners and successfully closed about 120 unlined landfills.

What challenges does DEP face in closing the remaining unlined solid waste landfills?

The main challenge is finding nearby adequate alternative waste disposal means for communities that have relied on unlined landfills for many years. DEP is not permitting construction of new unlined landfills. In some cases waste is hauled over long distance to permitted lined landfills, combustion facilities, recycling facilities and composting facilities. This challenge is addressed in the *Beyond 2000 Solid Waste Master Plan*.

Clean Up Waste Sites Goal #6: Ensure the sound closure and cleanup of contaminated sites at licensed and interim-status hazardous waste treatment, storage, and disposal facilities

What is the difference between this program and the Waste Site Cleanup Program?	The majority of assessments and cleanups of hazardous waste facilities are being overseen by DEP under the Massachusetts Hazardous Waste Regulations, or by EPA under the RCRA Corrective Action Program (MCP) rather than under the Waste Site Cleanup Program's Massachusetts Contingency Plan. These cleanups must still meet the substantive performance standards in the MCP.
What is the status of cleanups of these facilities?	Cleanups (or "corrective actions") have been ongoing at these facilities since the mid-1980s. At present, 23 facilities subject to RCRA Corrective Action are conducting cleanups. Nine of these are commercial hazardous waste treatment, storage and disposal facilities (TSDFs). Three additional commercial TSDFs have completed cleanups and another one is operating a pump and treat system as a final remedy. Stabilization measures to mitigate potential indoor air impacts are being implemented at two facilities under state oversight. Imminent hazard evaluations are continuing at two facilities.
How does DEP work in partnership with EPA to clean up these facilities?	DEP and EPA continue an informal, but long established, practice of sharing the work at these facilities in order to minimize duplication and to maximize the use of both agencies' limited resources. The Massachusetts Contingency Plan allows facilities to conduct assessment and cleanup activities under EPA RCRA oversight without the need for DEP oversight, while assuring that the cleanup is consistent with and as protective as any other under the MCP. Under this practice, EPA is overseeing the cleanup at three facilities, and two other facilities are implementing voluntary assessments under agreements with EPA. Eventually, these two facilities will implement remedies under EPA permits or orders subject to the MCP. DEP and EPA periodically meet to discuss the status of activities at those facilities under EPA oversight and those implementing cleanups under the state Hazardous Waste and Waste Site Cleanup programs. In addition, DEP and EPA consult and assist each other with issues that relate to the implementation of RCRA and the MCP at other sites conducting cleanups under the MCP.
What does DEP do to prevent future problems at hazardous waste facilities regulated under RCRA?	Beginning in 1990, DEP began to include corrective action/cleanup provisions in the hazardous waste licenses for any commercial hazardous waste facility that was not conducting cleanup under EPA's RCRA Corrective Action program. Numerous response actions have been performed, including but not limited to tank and soil removals, access restriction measures, indoor air venting system installation, and remedial system installations (pump and treat, sparge systems). In addition, due to these corrective actions, releases from abutting non-hazardous waste facilities have been discovered, including some with imminent hazards. These abutting non-RCRA sites are being addressed through the MCP. Groundwater monitoring is required at licensed commercial facilities that have completed cleanup to assure conditions are maintained.

What are challenges for 2002-2003?

DEP will perform RCRA Corrective Action supplemental grant work as described in a letter from Jim Colman to Matt Hoagland dated February 27, 2001 and approved in a letter from Matt Hoagland to Jim Colman dated May 31, 2001. Here are the significant milestones outlined in the February 27 letter:

- Assist EPA in evaluating Environmental Indicators (EI's) at the remaining sites on the GPRA list not yet completed
- Develop a list of those sites which can meet EI's in FFY 2002
- Conduct an initial review of RCRA Corrective Action Authorization and meet with EPA to discuss the regulatory framework for possible authorization, and
- Meet with EPA to discuss this conceptual framework and set milestones for implementing the proposal in FFY 2002.